Instructions for use

Atlan
A300, A300 XL, A350, A350 XL

WARNING

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

Anesthesia workstation
Software 1.0n

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Contents

1 Information about this document

1.1 Typographical conventions

Text Bold, italicized text indicates labels on the device and screen text.

1. Numbers with a period indicate the individual steps within a process sequence. The numbering for each new process sequence starts once more at number 1.

a. Lower-case letters with a period indicate secondary process steps. The lettering for each new higher-level process step starts once more with the letter a.

► This triangle indicates individual steps without any specific order.

(1) Numbers in parentheses refer to elements in illustrations.

1 Numbers in illustrations denote elements referred to in the text.

– Dashes indicate listings.

> The greater-than symbol indicates the navigation path in a dialog.

 This symbol indicates information that will facilitate the use of the product.

1.2 Use of terms

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

The product "Atlan A300, A300 XL, A350, A350 XL" is also referred to as "Atlan".

1.3 Illustrations

Illustrations of products and screen content in this document may differ from the actual products depending on configuration and design.

1.4 Trademarks

1.4.1 Trademarks owned by Dräger

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1.4.2 Trademarks owned by third-party manufacturers

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2 Safety-related information

2.1 Intended use

This device is intended for use in anesthetizing adults, pediatric patients, and neonates. The device can be used for mechanical ventilation, manual ventilation, pressure-supported spontaneous breathing, and spontaneous breathing.

The device is equipped with the following basic functions:

– Ventilation monitoring
– Inspiratory O_2 measurement
– Device monitoring
– Anesthetic gas receiving system

The following options are additionally available:

– Patient-gas measurement module for O_2, CO_2, N_2O, and anesthetic gases
– O_2 insufflation

Anesthesia is achieved through a mixture of pure oxygen and Air (medical compressed air) or pure oxygen and nitrous oxide, with the addition of volatile anesthetic agents.

Ventilation is accomplished on the patient through a laryngeal mask, a breathing mask, or an endotracheal tube.

The integrated breathing system can be used with partial rebreathing (low-flow or minimum-flow).

A non-rebreathing system, such as the Bain, Mapleson, Kuhn, or Waters system, may be used at the external fresh-gas outlet.

2.2 Indications

The device is specified for inhalational anesthesia and/or patient ventilation in accordance with the intended use during surgical or diagnostic interventions.

2.3 Contraindications

The device has no product-specific contraindications.

It is the responsibility of the user to select the appropriate treatment for the patient's underlying disease. The patient's condition must be continually monitored for any potential changes.

The safety information must be followed for patients suspected of malignant hyperthermia, patients with ketoacidosis, and patients who are under the influence of alcohol. Observe the following information: "Therapy and applications", page 89.

ℹ The device administers medical gases such as O_2, N_2O, Air (medical compressed air), and volatile anesthetic agents (halothane, enflurane, isoflurane, sevoflurane, desflurane). For contraindications to the applied medical gases, strictly follow the instructions for use of the medical gases.

2.4 Environments of use

The device is designed for use in rooms in which therapeutic or diagnostic interventions can be performed under constant supervision of users. According to IEC 60601-1-2, the use of the device is only permissible in hospitals and comparable facilities with a Class A electromagnetic environment.

Do **not** use the device in the following environments:

- Outside buildings
- On intensive care units
- During patient transport
- In vehicles, airplanes, helicopters, and on ships
- In areas where oxygen concentrations above 25 Vol% or combustible or explosive gas mixtures can occur.
- In rooms with magnetic field applications (e.g., magnetic resonance imaging)

2.5 Essential performance features

Correct functioning of the essential performance features ensures that the product can be used in accordance with its intended use. The product has the following essential performance features:

General

- Supply of the anesthesia workstation with O_2:
  If the O_2 supply (central gas supply or gas cylinder) fails, an alarm is issued.
- Supply of the patient with adequately oxygenated breathing gas:
  If the breathing gas contains insufficient levels of O_2, an alarm is issued.
- Supply of an adequate anesthetic gas concentration to the patient:
  When the anesthetic gas is measured by means of an integrated patient-gas measurement module, an alarm will be generated if the anesthetic gas concentrations are too high.
- Monitoring of the airway pressure:
  Alarms are issued depending on the set alarm limits.

Gas measurement

- Breathing gas monitoring:
  - Set values for FiO_2
  - Inspiratory and expiratory measured values for O_2, CO_2, N_2O, and anesthetic gas; automatic anesthetic agent identification (patient-gas measurement module)

  The gas composition is measured with ISO accuracy.
- Monitoring of breathing gas concentrations:
  Alarms will be issued depending on the set alarm limits or if the gas measurement fails.

2.6 User group requirements

The term "user group" describes the responsible personnel who have been assigned by the operating organization to perform specific tasks on the product.

2.6.1 Duties of the operating organization

The operating organization must ensure the following:

- Each user group has the required qualification (e.g., has undergone specialist training or acquired specialist knowledge through experience).
- Each user group has been trained to perform the task.
- Each user group has read and understood the relevant chapters in this document.

2.6.2 User groups

Clinical users

This user group uses the product in accordance with the intended use.

Reprocessing personnel

This user group performs reprocessing activities.

Service personnel

This user group installs the product and performs service activities.

If product-specific skills or tools are required, then the service activities must be performed by specialized service personnel. The specialized service personnel have been trained by Dräger to perform these specific service activities on this specific product.

2.7 Information on safety instructions and precautionary statements

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

2.7.1 Safety instructions

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

2.7.2 Precautionary statements

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

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

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

2.8 Safety instructions

2.8.1 Instructions for use

Personal injury and property damage may arise if this product is used contrary to the information in these instructions for use.

- ► Follow these instructions for use.
- ► Only use this product in accordance with its intended use.
- ► Keep these instructions for use in an accessible location. Make sure that the instructions for use are compatible with the device software.
- ► Follow the instructions for use of all the products that are used with this product.

ℹ These instructions for use do not provide any information on the following:

- – Risks that are obvious to the user
- – Consequences of foreseeable misuse of the product
- – Possible negative effects on patients with one or more diseases

2.8.2 Symbols and product labels

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

- ► Observe the symbols and product labels.

2.8.3 Monitoring the patient's condition

The monitoring of the patient's condition can range from direct observation to electronic monitoring by means of medical devices. If the patient's condition is not adequately monitored, the patient may be put at risk.

- ► Monitor the patient's condition in an appropriate manner and at appropriate intervals.

N_2O, O_2, CO_2 and, where necessary, anesthetic gases must be monitored when patients are ventilated. If no monitoring is available or the sensors are not ready for operation, the patient will not be adequately monitored and may be put at risk.

- ► Provide for suitable monitoring of O_2, CO_2, N_2O, and anesthetic gases in accordance with ISO 80601-2-55.
- ► Provide for suitable substitute monitoring in the event of a fault.

2.8.4 Accessories and components

Compatible accessories

The use of faulty or incompatible accessories may compromise the functional integrity of the product. Personal injury and property damage may occur as a consequence.

► Use only compatible accessories. The accessories that are compatible with this product are listed in the list of accessories supplied with the product.

► Use only accessories that are in good working order.

Instructions for use for accessories

If accessories or connected devices are used contrary to the information in the associated instructions for use, this may lead to user errors, incorrect use, or incorrect reprocessing. Personal injury and property damage may occur as a consequence.

► Follow the instructions for use for all accessories, e.g.:

- Water traps
- Flow sensors
- CLIC adapter
- CLIC absorber
- Soda lime
- Breathing hoses
- Masks
- Filter
- Bronchial suction
- Vaporizer
- Manual resuscitator
- AGSS terminal unit

2.8.5 Color codes and labels

In some countries, the arrangement and display of the gases on the status display and the virtual flow tubes on the screen may deviate from the illustrations shown in this document.

► Always pay attention to the respective color codes and labels.

2.8.6 Device

Penetrating liquid

Penetrating liquid may cause the following:

- Damage to the device
- Electric shock
- Device malfunctions

Personal injury and property damage may occur as a consequence.

► Ensure that no liquid penetrates the device.

► Do not place any containers containing liquids above or on the device.

Housing

Under the housing, there are live electrical components, which may cause an electric shock.

► The housing may only be opened by those user groups that are assigned to that particular measure.

2.8.7 Service

If service activities are not performed regularly or properly, malfunctions may occur that can result in personal injury and property damage.

► Perform the service in accordance with the chapter "Service".

2.8.8 Reprocessing

Reusable products must be reprocessed, otherwise there is an increased risk of infection.

► Perform the reprocessing in accordance with the chapter "Reprocessing".

2.8.9 Modifications to the product

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

► Do not modify this product.

2.8.10 Network security

The impermissible use of data interfaces may result in property damage and personal injury.

► Only make connections to data interfaces with permission from the responsible organization (IT representative and the hospital equipment officer).

► Observe the following information: "Connections to IT networks", page 294.

2.9 Additional information

2.9.1 Use of Infinity ID components

Ownership or purchase of this medical device with RFID technology only includes the right to use the medical device and RFID technology in conjunction with products approved by Dräger and in strict compliance with these instructions for use. No intellectual property rights or any rights to the use of the medical device or RFID technology are hereby granted, either explicitly or implicitly, which are contrary to the above-mentioned conditions.

2.9.2 Training

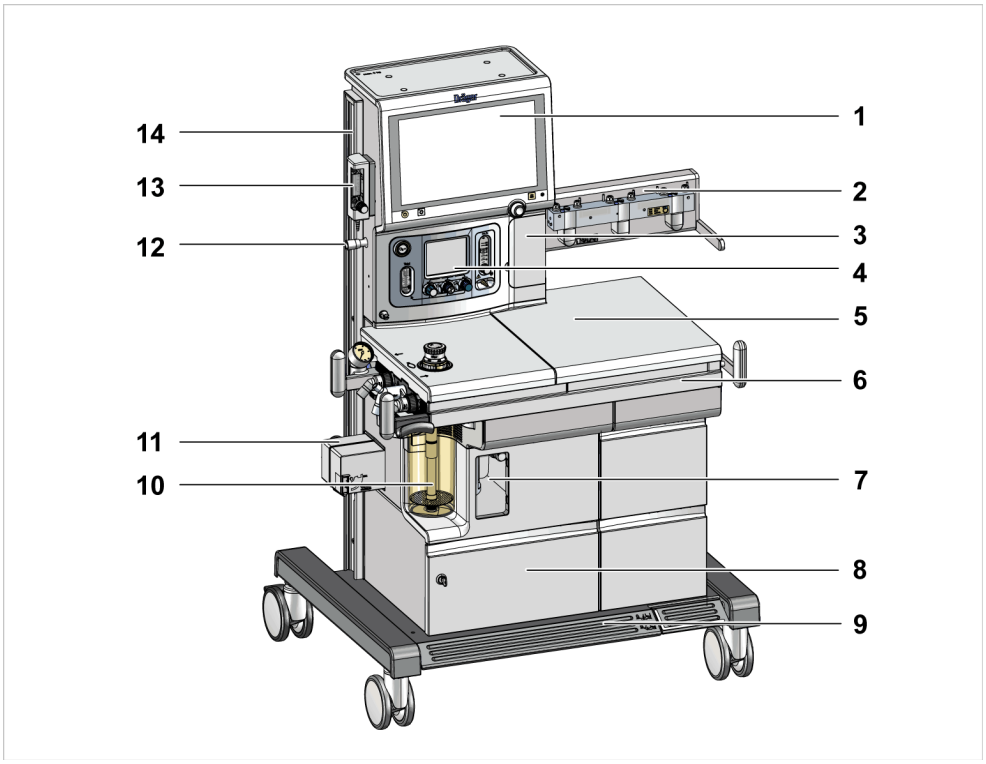
Training for users is available via the Dräger organization responsible (see www.draeger.com).

3 Overview

3.1 Hardware

3.1.1 Front

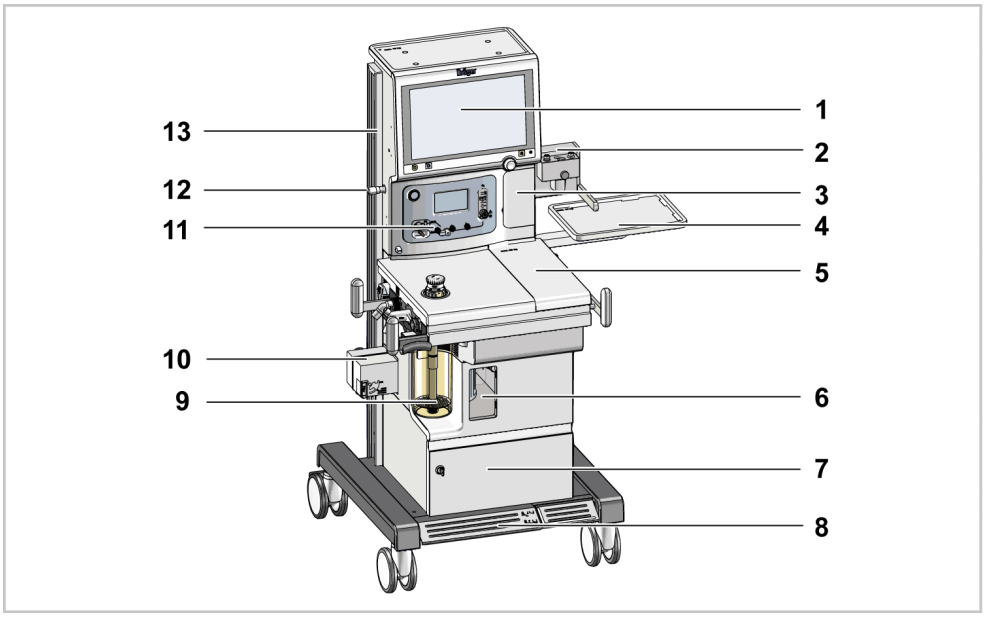
3.1.1.1 Large version



No.	Designation	Description
1	Screen	Enables user inputs by touchscreen and rotary knob.
2	Plug-in connectors for vaporizers	Enable the connection of up to 3 vaporizers.
3	Backup manual switch (behind the flap)	Used to switch to backup manual mode in the event of malfunctions of the device.
4	Gas mixing unit	Produces a gas mixture from the selected gases (e.g., O_2 and Air).
5	Work surface	Used for storing, e.g., documents.
6	Pull-out writing tray (option)	Provides additional work surface.
7	Viewing window for piston ventilator	Allows visual checking of the movement of the piston ventilator.
8	Lockable drawer	Provides additional storage space.
9	Trolley with footrest and central brake	Used for moving the device. The central brake locks the two front castors.
10	CO_2 absorber	Absorbs CO_2 from the patient's breathing gas.

No.	Designation	Description
11	Anesthetic gas receiving system	Used for suctioning and scavenging excess anesthetic gas and breathing gas. Used to reduce the anesthetic gas concentration released into the environment by the anesthesia machine, and to scavenge the sample gases from an anesthetic gas monitor.
12	External fresh-gas outlet	Gas outlet for a mixture of fresh gas and anesthetic gas which is fed to a non-rebreathing system.
13	External O_2 flowmeter (option)	Supplies pure oxygen for O_2 insufflation.
14	Rail	Used for fastening additional components.

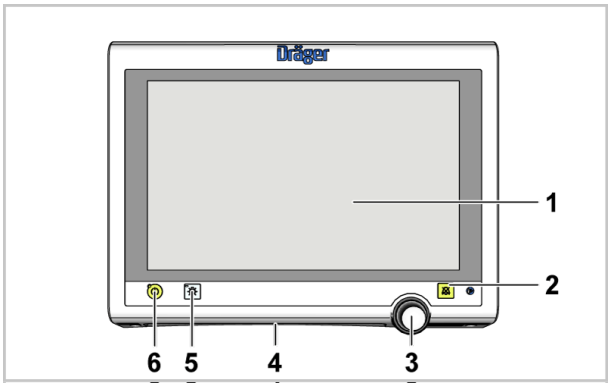
3.1.1.2 Compact version



No.	Designation	Description
1	Screen	Enables user inputs by touchscreen and rotary knob.
2	Plug-in connectors for vaporizers	Enable the connection of up to 2 vaporizers.
3	Backup manual switch (behind the flap)	Used to switch to backup manual mode in the event of malfunctions of the device.
4	Swiveling shelf (option)	Used for storage.
5	Work surface	Used for storing, e.g., documents.
6	Viewing window for piston ventilator	Allows visual checking of the movement of the piston ventilator.
7	Lockable drawer	Provides additional storage space.
8	Trolley with footrest and central brake	Used for moving the device. The central brake locks the two front castors.
9	CO_2 absorber	Absorbs CO_2 from the patient's breathing gas.

No.	Designation	Description
10	Anesthetic gas receiving system	Used for suctioning and scavenging excess anesthetic gas and breathing gas. Used to reduce the anesthetic gas concentration released into the environment by the anesthesia machine, and to scavenge the sample gases from an anesthetic gas monitor.
11	Gas mixing unit	Produces a gas mixture from the selected gases (e.g., O_2 and Air).
12	External fresh-gas outlet	Gas outlet for a mixture of fresh gas and anesthetic gas which is fed to a non-rebreathing system.
13	Rail	Used for fastening additional components.

3.1.2 Screen



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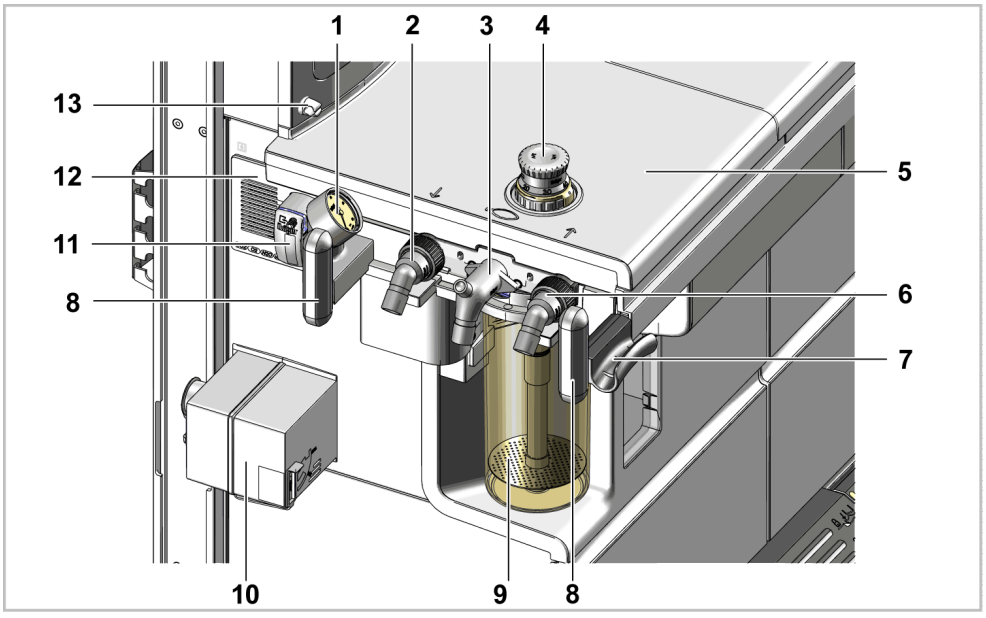
No.	Designation	Description
1	Touchscreen	Calls up functions or dialogs when touched.
2	Alarm silence key	Suppresses the alarm tones of all active alarms for 2 minutes.
3	Rotary knob	Used for selecting, adjusting, and confirming settings. Lights up in color in certain situations.
4	Working light	Illuminates the work surface.
5	key	Turns the working light on or off. Dims the illuminance in 3 steps (dark, medium, and bright).
6	key	Turns the device on or off.

3.1.3 Breathing system and other components

3.1.3.1 Overview

The following illustration shows the device and the breathing system.

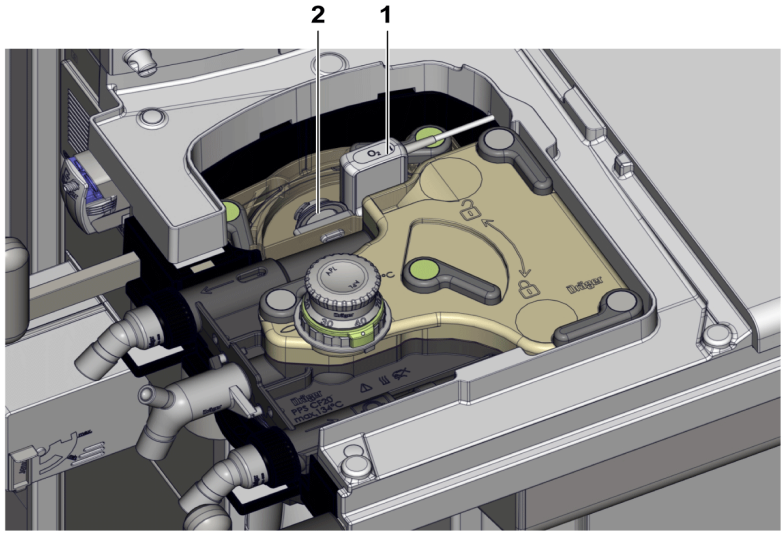


No.	Designation	Description
1	Pressure gauge (option)	Indicates the airway pressure in the internal breathing system.
2	Inspiratory port	Used to connect the inspiratory hose to the device.
3	Bag elbow with circuit plug	Used to connect the breathing bag hose. The circuit plug is used to seal the Y-piece during an automatic test.
4	APL valve	Limits the maximum airway pressure in the Manual / Spontaneous mode.
5	Breathing system cover	Protects the breathing system underneath and provides climate control for the breathing system.
6	Expiratory port	Used to connect the expiratory hose to the device.
7	Holder	Used for parking the breathing bag hose.
8	Handles	Used for aligning the device and for stowing used breathing hoses.
9	CO_2 absorber	Absorbs CO_2 from the patient's breathing gas.
10	Anesthetic gas receiving system	Used for suctioning and scavenging excess anesthetic gas and breathing gas, to reduce the anesthetic gas concentration released into the environment by the anesthesia machine, and to scavenge the sample gases from an anesthetic gas monitor.

No.	Designation	Description
11	Water trap with connection for sample line	Collects condensed water which forms in the sample line.
12	Patient-gas measurement module	Measures and monitors various gas concentrations in the breathing gas (O_2, CO_2, N_2O, and anesthetic gases).
13	Guide clip	Used to securely lay the O_2 insufflation hose.

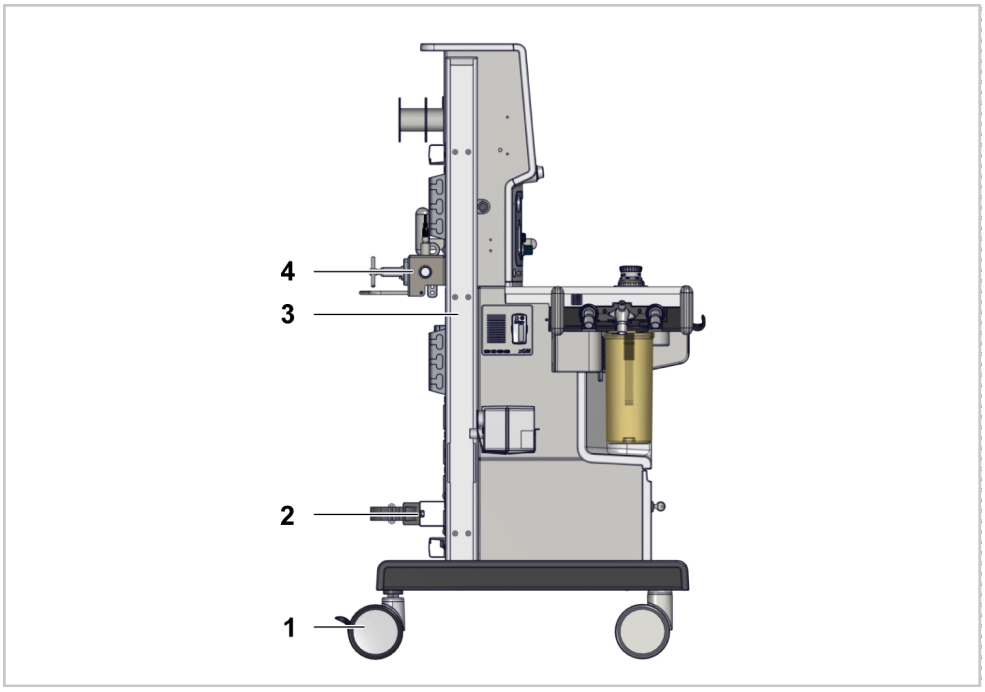
3.1.3.2 Version with O_2 sensor

The following illustration shows the device without its breathing system cover and illustrates the position of the O_2 sensor.



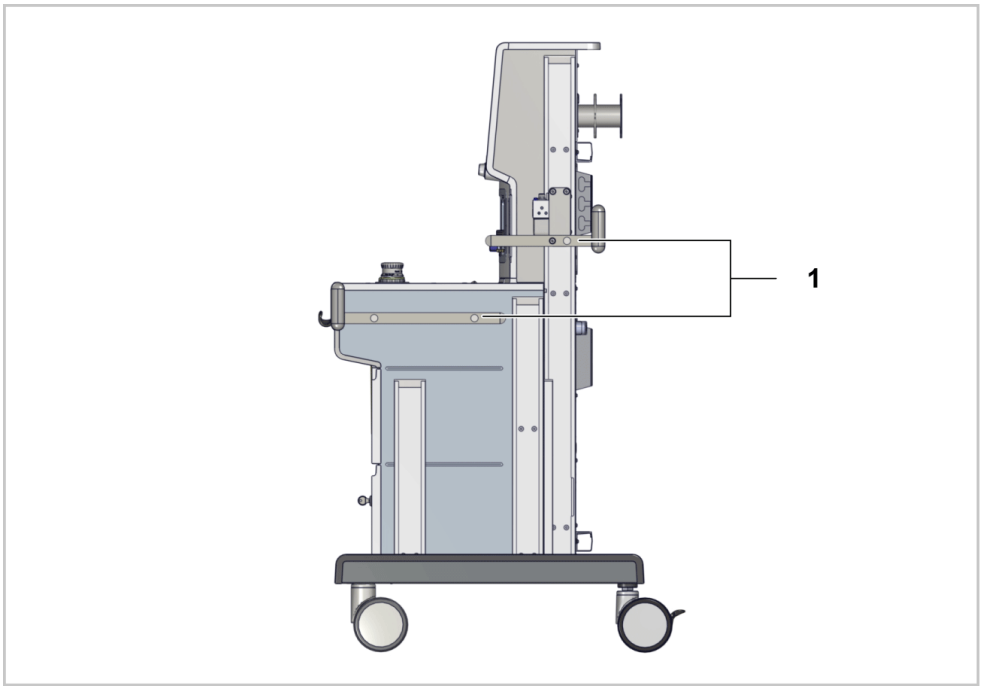
No.	Designation	Description
1	O_2 sensor	Measures the inspiratory O_2 concentration in the breathing gas.
2	Sealing cap	Seals the O_2 sensor port during calibration of the O_2 sensor.

3.1.4 Side view from left



No.	Designation	Description
1	Castor brake	Prevents movement of the rear castor.
2	Gas cylinder holder (option)	Secures the gas cylinders.
3	Rail	Used for fastening additional components.
4	Hanger yoke system (option)	Enables the connection of gas cylinders with a pin-index connector.

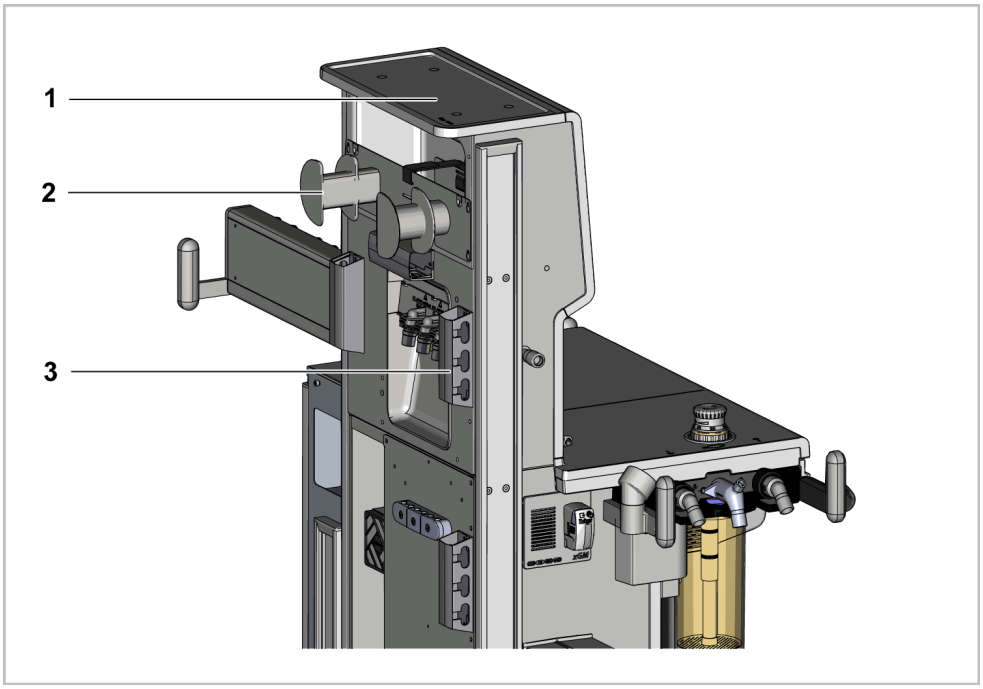
3.1.5 Side view from right



No.	Designation	Description
1	Standard rail with handle	Allows the device to be maneuvered during intrahospital transport and also the attachment of accessories.

3.1.6 Device column

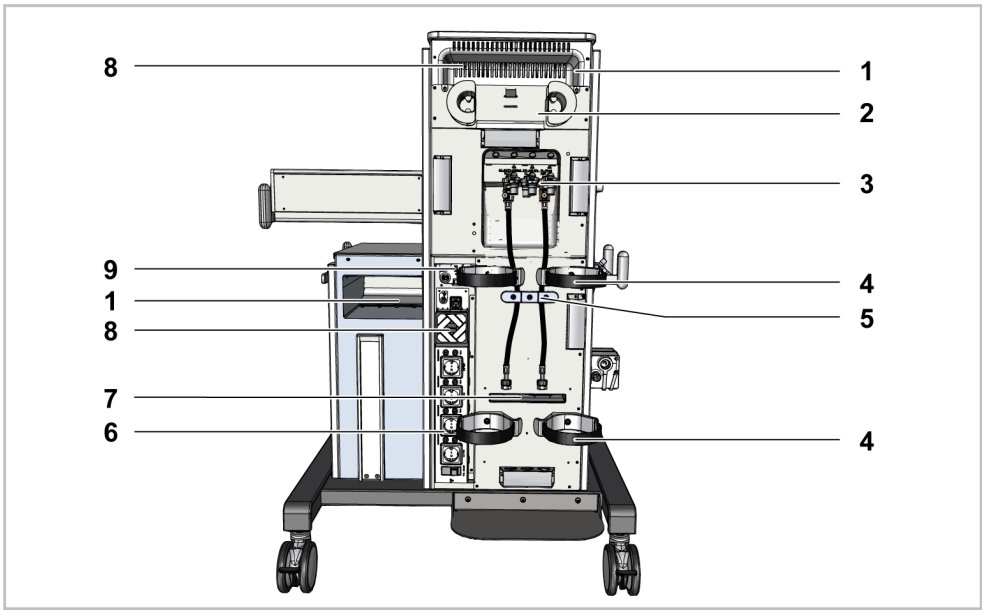
The illustration shows the left side of the device.



No.	Designation	Description
1	Column cover	Depending on the version, allows a patient monitor or other workplace components to be mounted.
2	Holder for hoses and cables	Used for storing and winding up central supply hoses and cables.
3	Cable holder with cable channels	For passing hoses and cables through.

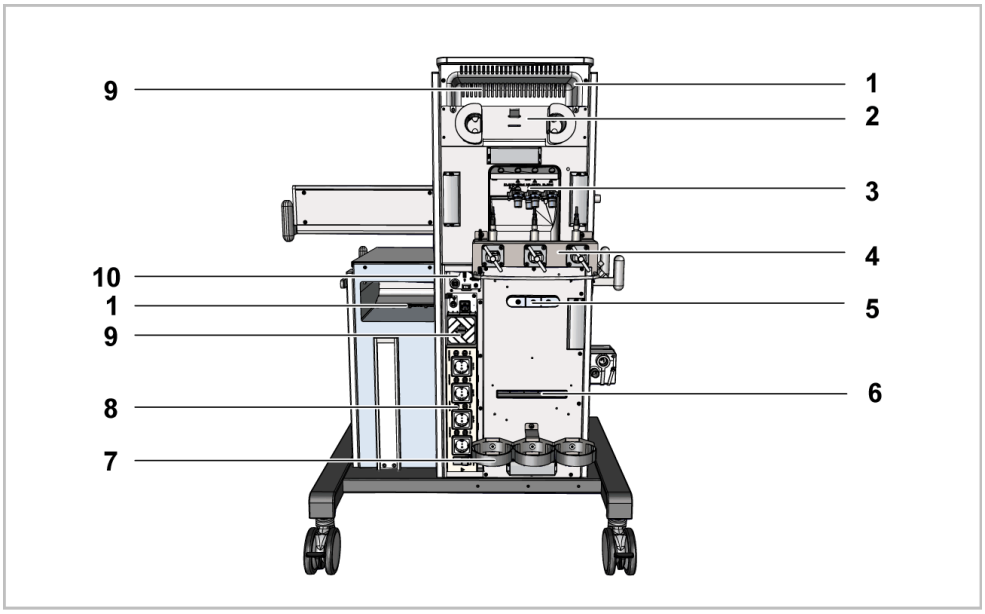
3.1.7 Rear

3.1.7.1 Version with screw connections for standing gas cylinders



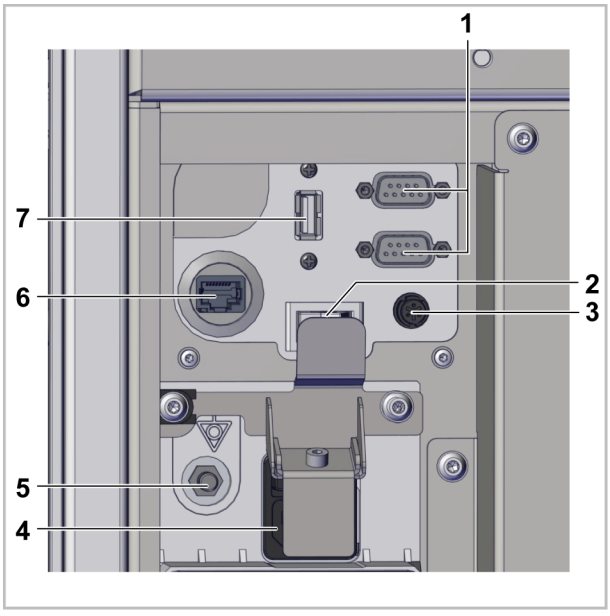
No.	Designation	Description
1	Storage compartment	Can be used as storage space.
2	Holder for hoses and cables	Used for storing and winding up central supply hoses and cables.
3	Gas supply block	Provides connectors for gases from the central gas supply system and for gas cylinders.
4	Gas cylinder holder (option)	Secures the gas cylinders.
5	Strain relief for compressed gas hoses	Protects the compressed gas hoses from loosening inadvertently.
6	Auxiliary power sockets (option)	Allow other devices to be connected.
7	Vent	Discharges warmed air from the device into the environment.
8	Ventilation slot	Feeds ambient air to the device for ventilation.
9	Connectors	Provides connectors for power cable, potential equalization, and interfaces. Used for data exchange between external devices, additional components, and networks.

3.1.7.2 Version with pin-index connector for suspended gas cylinders (option)



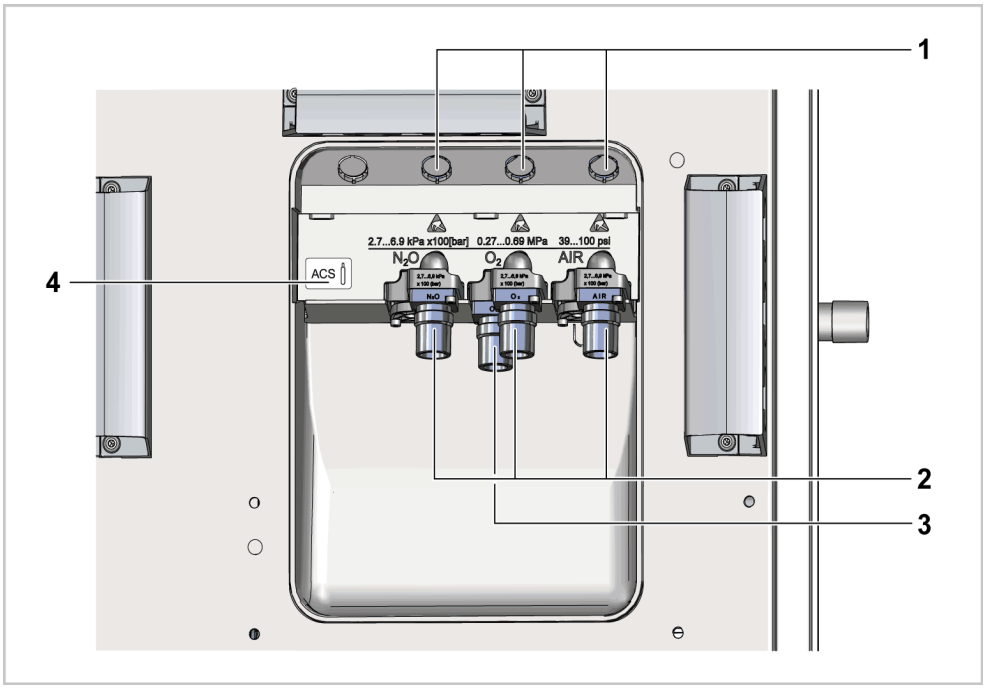
No.	Designation	Description
1	Storage compartment	Can be used as storage space.
2	Holder for hoses and cables	Used for storing and winding up central supply hoses and cables.
3	Gas supply block	Provides connectors for gases from the central gas supply system and for gas cylinders.
4	Hanger yoke system (option)	Enables the connection of gas cylinders with a pin-index connector.
5	Strain relief for compressed gas hoses	Protects the compressed gas hoses from loosening inadvertently.
6	Vent	Discharges warmed air from the device into the environment.
7	Gas cylinder holder (option)	Secures the gas cylinders.
8	Auxiliary power sockets (option)	Allow other devices to be connected.
9	Ventilation slot	Feeds ambient air to the device for ventilation.
10	Connectors	Provides connectors for power cable, potential equalization, and interfaces. Used for data exchange between external devices, additional components, and networks.

3.1.8 Connectors



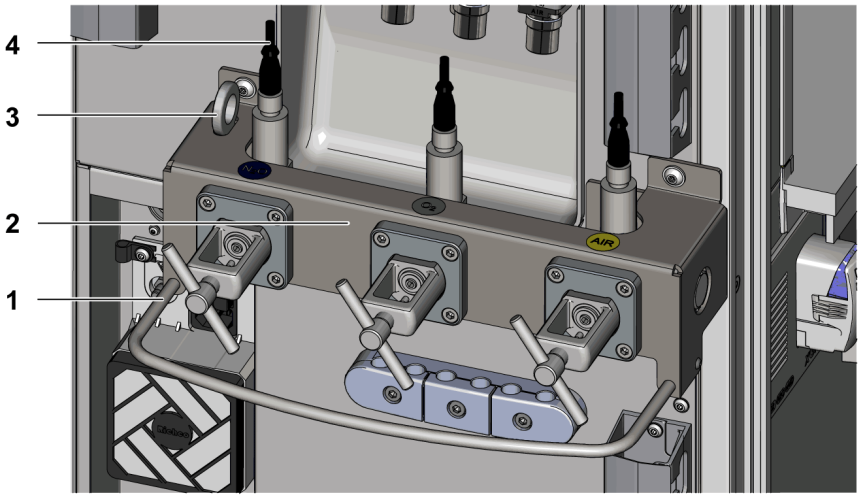
No.	Designation	Description
1	Serial port (COM 1 and COM 2)	This serial port (RS232) supports the MEDIBUS.X protocol for data exchange between the anesthesia machine and external devices.
2	Main switch	Turns the device off and minimizes the current consumption when the power plug is pulled out. To be used when the device is to be disconnected from the power supply for longer than 2 weeks and during service activities.
3	Connector for workplace light (option)	Used for connecting an external workplace light.
4	Power inlet (connector for power cable)	Used to connect the device to the mains power supply.
5	Potential equalization pin	Used for connecting a potential equalization cable. This will minimize differences in electrical potential.
6	Network port	Enables data transfer within an IT network.
7	USB port	Used to transfer data to a USB mass storage device.

3.1.9 Gas inlets



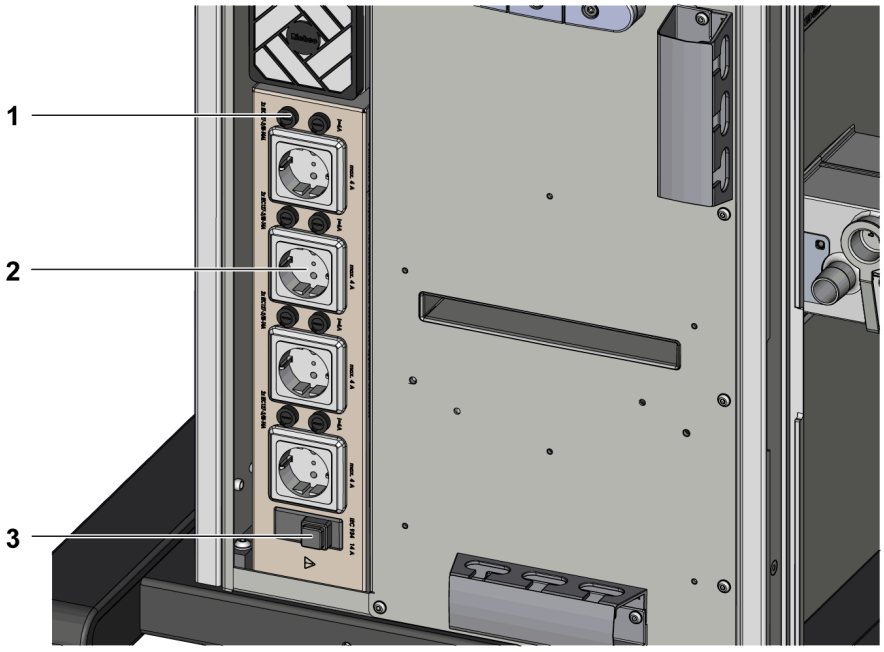
No.	Designation	Description
1	Connectors for pressure measuring lines for gas cylinders (option)	Used for connecting pressure measuring lines of the pressure reducers on the gas cylinders.
2	Connectors for central gas supply system	Enable the device to be supplied with gases from the central supply.
3	Connectors for gas cylinders (option)	Enable the device to be supplied with gases from the gas cylinders.
4	Label Advanced Cylinder Support	On devices that are equipped with Advanced Cylinder Support, the gas cylinder valves can also remain open during operation with the central supply.

3.1.10 Hanger yoke system with pin-index connection (option)



No.	Designation	Description
1	Protection bar	Protects the connectors for the gas cylinders from damage.
2	Hanger yoke system with three pin-index connections (option)	Enables the connection of gas cylinders with a pin-index connector.
3	Wrench	For opening and closing the gas cylinder valves.
4	Connecting cable	Enables electronic gas pressure measurement.

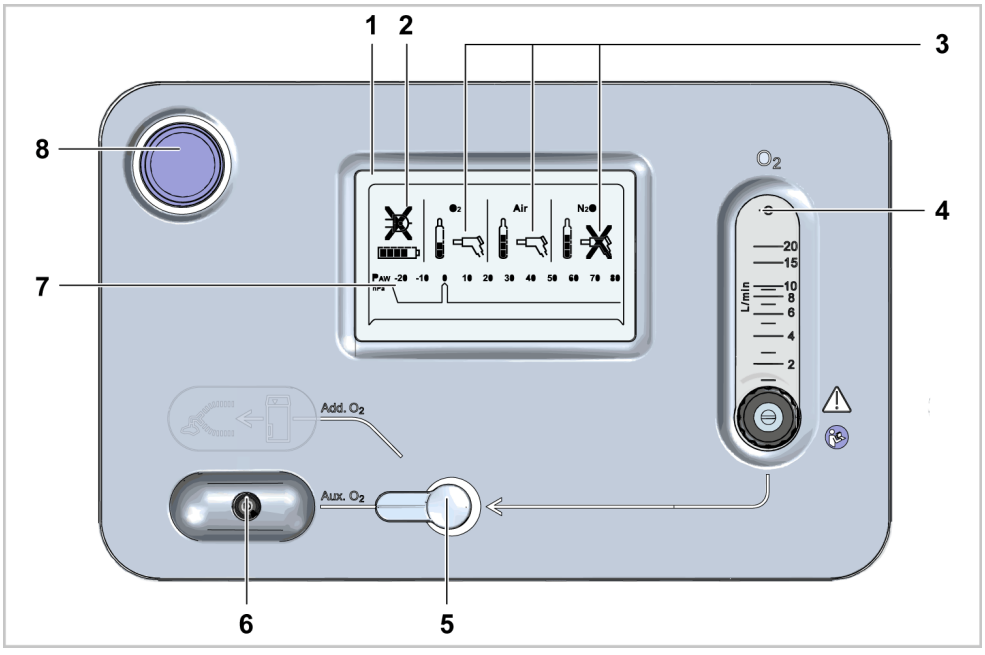
3.1.11 Auxiliary power sockets (option)



No.	Designation
1	Fuses, 2 each per power socket
2	Auxiliary power sockets, 4 pcs.
3	Main fuse

3.1.12 Gas mixing unit

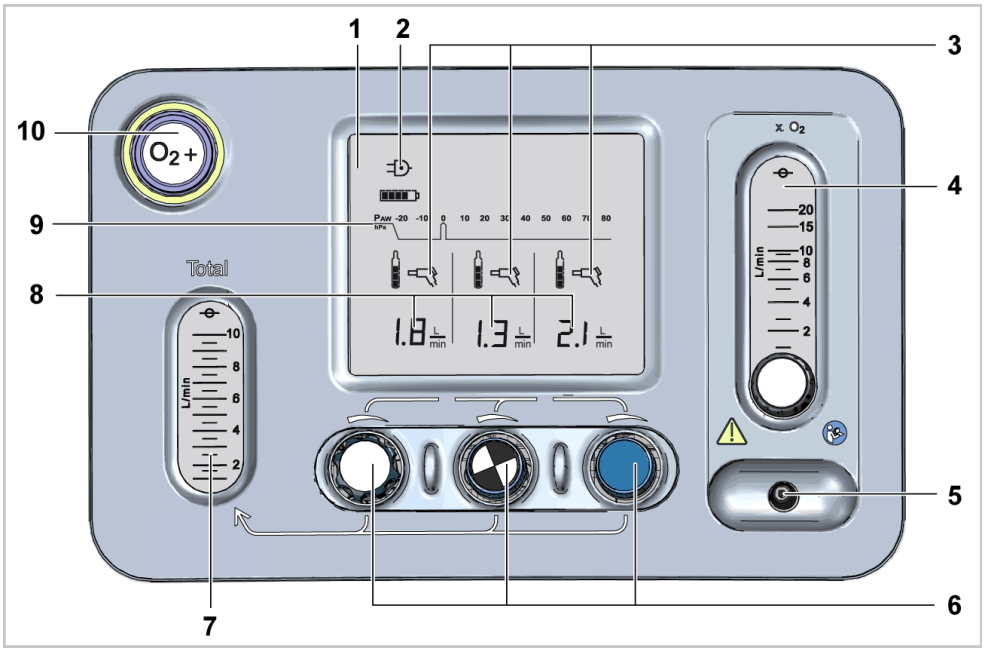
3.1.12.1 Gas mixing unit (electronically controlled)



No.	Designation
1	Status display
2	Symbols for mains power supply and power supply from internal battery
3	Symbols for gas supply (O_2, Air, N_2O or O_2, Air) from central supply and gas cylinders
4	O_2 flowmeter (for O_2 insufflation ***Aux. O_2*** and emergency O_2 delivery ***Add. O_2***)
5	O_2 switch (for switching between O_2 insufflation ***Aux. O_2*** and emergency O_2 delivery ***Add. O_2***)
6	Outlet for O_2 insufflation, e.g., for nasal cannula
7	Display of pressure in the internal breathing system, see page 18
8	***O_2+*** key (O_2 flush)

The explanation of the symbols can be found on page 317.

3.1.12.2 Gas mixing unit (mechanically controlled)



No.	Designation
1	Status display
2	Symbols for mains power supply and power supply from internal battery
3	Symbols for gas supply (O_2, Air, N_2O or O_2, Air) from central supply and gas cylinders
4	O_2 flowmeter (for O_2 insufflation ***Aux. O_2***) (option)
5	Outlet for O_2 insufflation, e.g., for nasal cannula (option)
6	Flow control valves (O_2, Air, N_2O or O_2, Air)
7	Total flow tube
8	Display of the set fresh-gas flows
9	Display of pressure in the internal breathing system, see page 18
10	***O_2+*** key (O_2 flush)

The explanation of the symbols can be found on page 317.

3.2 Functional scope

3.2.1 Product variants, options, and accessories

Some device functions are available as an option and consequently are only available on appropriately equipped devices. Not all product variants or options are available worldwide.

The device is intended for use with the options and accessories listed in the associated list of accessories.

Hardware options

Hardware options are listed in the following table:

Name	Description
Compact version (model designation A300, A350)	– Version with small trolley for environments of use with constricted space – 1 large drawer – Central brake – Available with plug-in connectors for 1 or 2 vaporizers – The work surface can be enlarged with a folding table extension on the side (option). – When heavy workplace components, monitors, or syringe pumps are attached, a counterweight is required for increased tipping stability (option).
Large version (model designation A300 XL, A350 XL)	– Version with large trolley for normal OR environments with adequate space – 1 large and 2 small drawers – Available with plug-in connectors for 2 or 3 vaporizers – Can be fitted with a pull-out writing tray and a folding table extension on the side (option).
Mechanically controlled gas mixer (model designation A300)	– The fresh-gas delivery is adjusted by means of manually operated needle valves. – The individual fresh-gas flows are measured electronically and displayed on both the status display and the screen. – The total fresh-gas flow is indicated on the integrated total flow tube. – Available as a 2-gas version (O_2/Air) or a 3-gas version (O_2/Air/N_2O) – Available with O_2 flowmeter for O_2 insufflation (option)

Name	Description
Electronically controlled gas mixer (model designation A350)	– The fresh-gas delivery is adjusted using the screen with the aid of settable parameters for O_2 concentration in % and for fresh-gas flow in L/min. – Depending on the version, Air or N_2O can be selected as the carrier gas. – With O_2 flowmeter for O_2 insufflation – With integrated, mechanical emergency O_2 delivery ***Add. O_2***
External fresh-gas outlet	– Allows use with external non-rebreathing systems, e.g.: – Mapleson – Kuhn – Bain – Magill – Waters
Advanced Cylinder Support	On devices that are equipped with Advanced Cylinder Support, the gas cylinder valves can also remain open during operation with the central supply.
Integrated O_2 monitoring	– Measurement, monitoring, and display of the inspiratory O_2 concentration – The measurement is performed by the O_2 sensor integrated in the breathing system.
Integrated patient-gas measurement module	– Measurement, monitoring, and display of the inspiratory and expiratory gas concentrations of O_2, anesthetic gases, CO_2, and N_2O – Detection and indication of anesthetic gas mixtures – Display of the xMAC
O_2 detection	– During the self-test, a check is made using the integrated patient-gas measurement module to ensure that the connected O_2 supply is actually delivering O_2.
Support of Infinity ID accessories	Allows the use of Dräger Infinity ID accessories with the following functions: – Generates a message when the maximum period of use is exceeded for the breathing circuit, the water traps, the CO_2 absorber, and the flow sensor – Generates a notice when the breathing circuit is incorrectly connected – Generates a message if the CO_2 absorber is not present or is not locked
Active anesthetic gas scavenging	Anesthetic gas scavenging with flow indicator for use with an active disposal system with a wall terminal unit
Passive anesthetic gas scavenging	Anesthetic gas scavenging for gas disposal without an active disposal system

Software options

Software options are listed in the following table:

Name	Description
Spontaneous breathing support	Allows assisted ventilation with pressure support and, in controlled ventilation modes, synchronization with the patient's inspiratory effort. Includes the following ventilation modes: – CPAP / PSV – PC - SIMV – PC - SIMV / PS – VC - SIMV – VC - SIMV / PS – VC - CMV / AutoFlow (requires AutoFlow option) – VC - SIMV / AutoFlow (requires AutoFlow option) – VC - SIMV / PS / AutoFlow (requires AutoFlow option)
AutoFlow	With AutoFlow, the set tidal volume VT is applied with all mandatory volume-controlled breaths at the lowest required pressure. With switchable synchronization and settable pressure support (requires the spontaneous breathing support option)
Advanced trends	Includes the following functions: – Graphical trends of measured values – Mini-trends next to the waveforms – Export of trend data to USB mass storage device
Advanced ventilation monitoring	Includes the following functions: – Display of patient compliance with trend – Display of loops (Pressure-Volume and Flow-Volume) – Volumeter (bar graphic for monitoring the inspiratory and expiratory tidal volumes) – Display of the patient-triggered, mechanically supported minute volume compared with the mandatory minute volume
Advanced gas monitoring	Includes the following functions: – Indicator and trend for efficiency of fresh-gas setting and anesthetic agent consumption, (econometer and low-flow wizard (no trend)) – Display of gas consumption – Display of anesthetic agent consumption and uptake – Display of MV×CO_2 with trend – Display of O_2 uptake with trend

Name	Description
Advanced neonatal support	Includes advanced ventilation functions and monitoring functions for the ventilation of neonates: – Minimum settable tidal volume of 5 mL – Higher sweep speed – Increased flow measurement sensitivity for more precise ventilation monitoring
Expert view	Provides the following advanced views: – 4 waveforms – 3 waveforms and one row with parameter fields

3.2.2 Ventilation drive

The device uses a piston drive as the ventilation drive and is equipped with compliance compensation and fresh-gas decoupling. For further information see: "Description of the ventilation drive", page 307.

3.2.3 Gas delivery

The device can deliver mixtures of medical gases to which an anesthetic agent is added by means of a vaporizer.

Available gas mixtures

– O_2 and Air with 2-gas mixer and 3-gas mixer
– O_2 and N_2O with 3-gas mixer

Usable anesthetic agents

– Sevoflurane
– Desflurane
– Isoflurane
– Halothane
– Enflurane

3.2.4 Ventilation modes

– Manual / Spontaneous
– CPAP / PSV
– PC - CMV
– PC - SIMV
– PC - SIMV / PS
– VC - CMV
– VC - SIMV
– VC - SIMV / PS
– VC - CMV / AutoFlow

– VC - SIMV / AutoFlow
– VC - SIMV / PS / AutoFlow

For a detailed description of the ventilation modes and the additional settings, see page 298.

3.2.5 Additional operation modes

– External fresh-gas outlet
– Pause
– CBM mode

3.2.6 Monitoring

The device can monitor the following:

– Airway pressure
– Minute volume
– Inspiratory O_2 concentration
– Inspiratory and expiratory anesthetic gas concentrations (only available with the integrated patient-gas measurement module)
– Inspiratory and expiratory CO_2 concentrations (only available with the integrated patient-gas measurement module)
– Inspiratory and expiratory N_2O concentrations (only available with the integrated patient-gas measurement module)
– Apnea (pressure, flow, and CO_2)
– Occurrence of anesthetic gas mixtures (only available with the integrated patient-gas measurement module)
– Lack of fresh gas in the breathing system and the breathing circuit

3.2.7 Display on the screen

The device can display the following information on the integrated screen:

– Waveforms
– Graphical trends
– Numeric trends
– Loops
– Alarm logbook
– Logbook
– Numeric parameters
– Econometer

3.2.8 Logbook

The device can capture and store the following data, among other things:

– Measured values
– Set values and related changes
– Patient data
– Ventilation modes

– Events (e.g., alarms, confirmed alarms, switch-on time and switch-off time)
– Test results
– Gas consumption
– Anesthetic agent consumption

3.2.9 Gas supply

The device can be supplied with the following gases:

Gas	Central supply	Gas cylinders
O_2	Yes	Permanently mounted Dräger pressure reducer (option) or Third-party manufacturer pressure reducer
Air	Yes	Permanently mounted Dräger pressure reducer (option) or Third-party manufacturer pressure reducer
N_2O	Yes (option)	

3.2.10 Gas scavenging

The gas can be scavenged by means of the following procedures:
– Active anesthetic gas scavenging
– Passive anesthetic gas scavenging

Further information can be found on page 65.

3.2.11 Data exchange, interfaces

3.2.11.1 Serial port

Two serial ports, COM 1 and COM 2, are provided for data transmission using the MEDIBUS.X communication protocol.

3.2.11.2 USB port

After a suitable USB flash drive is connected, the USB port enables, e.g., the following actions:
– Saving the screen contents as a screenshot.
– Saving and loading device configurations.
– Saving system test results or records as a text file.

Note the additional information on the specification of the USB port (see "Technical data", page 267).

3.2.11.3 Network port

If an appropriate service contract has been obtained, the Dräger Remote Service function can be executed.

The device can be connected to the Dräger ServiceConnect Gateway or a DrägerService computer.

If the connected network offers an NTP service, the time on the device can be synchronized with the time on the NTP server.

For further information see: "Connections to IT networks", page 294.

3.2.11.4 Support of Infinity ID accessories

– Replacement interval monitoring
– Anti-interchange security for breathing hoses

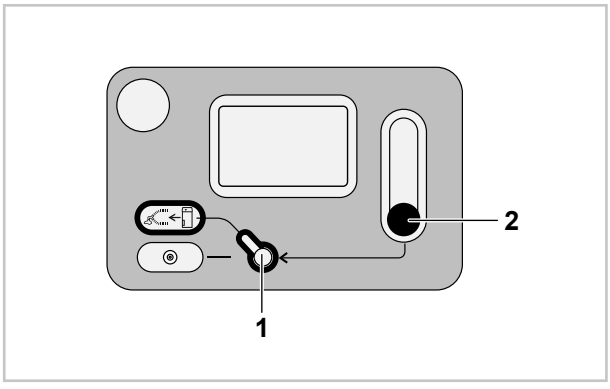
For further information see: "Support of Infinity ID accessories", page 312.

3.2.12 Safety functions

3.2.12.1 Emergency O_2 delivery (electronically controlled gas mixer)

⚠ CAUTION
Risk of increased anesthetic agent delivery
When the emergency O_2 delivery (***Add. O_2***) is in use, anesthetic agent continues to be delivered into the breathing system in accordance with the vaporizer setting. When the emergency O_2 delivery is used during low-flow anesthesia or minimal-flow anesthesia, an increased quantity of anesthetic agent may enter the breathing system. This may lead to an increased anesthetic gas concentration.
► Carefully monitor the gas mixture.

1. Check the vaporizer setting.
2. Set the O_2 switch (1) upwards to the ***Add. O_2*** position.



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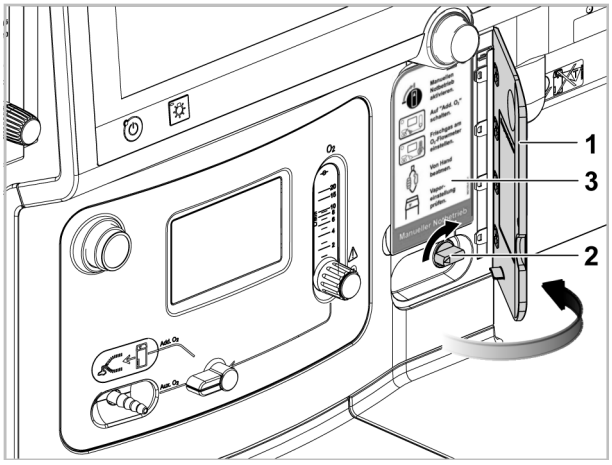
3. Open the flow control valve (2) on the O_2 flowmeter and set the desired flow. This O_2 flow flows through the vaporizer.

3.2.12.2 Backup manual mode

In various technical fault situations, the backup manual mode enables a direct changeover to manual ventilation in order to continue the therapy.

Backup manual mode with an electronically controlled gas mixer

1. Open the flap (1).



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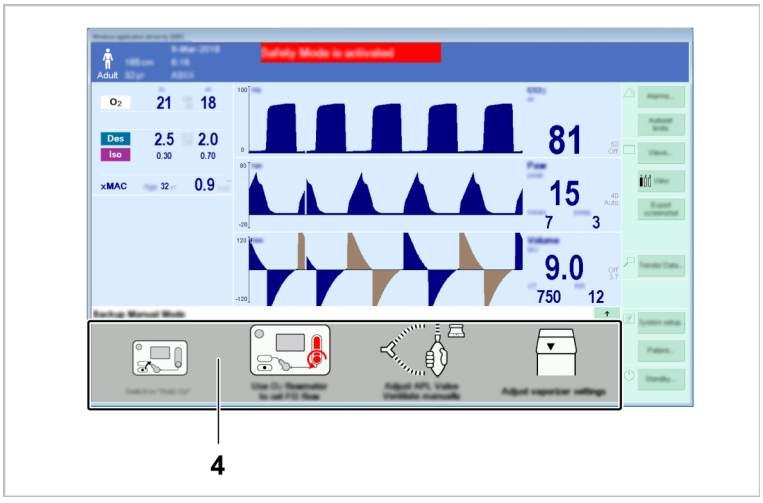
2. Activate the backup manual switch (2). Follow the instructions on the product label (3) or the screen (4).



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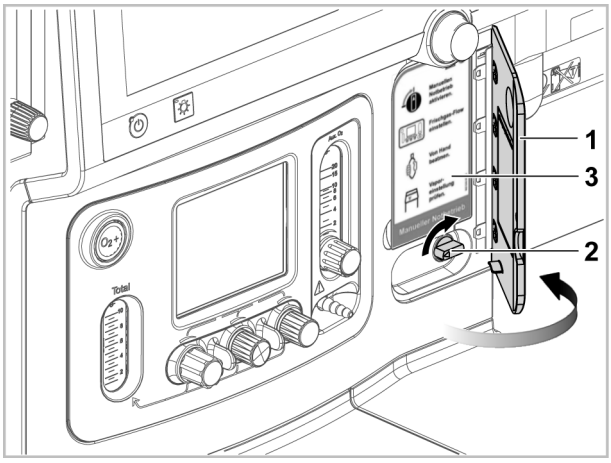
3. Set the O2 switch to ***Add. O2***.
4. Open the flow control valve on the emergency O2 delivery and set an adequate O2 flow. The set O2 flow constitutes the total fresh-gas flow.
5. Ventilate the patient manually.
   a. During mechanical ventilation or in the ***Man/Spon*** ventilation mode:
      Ventilate manually with the breathing bag.
   b. When using the external fresh-gas outlet:
      Ventilate manually with the breathing bag on the non-rebreathing system.
6. Check the vaporizer setting.

Backup manual mode with a mechanically controlled gas mixer

1. Open the flap (1).



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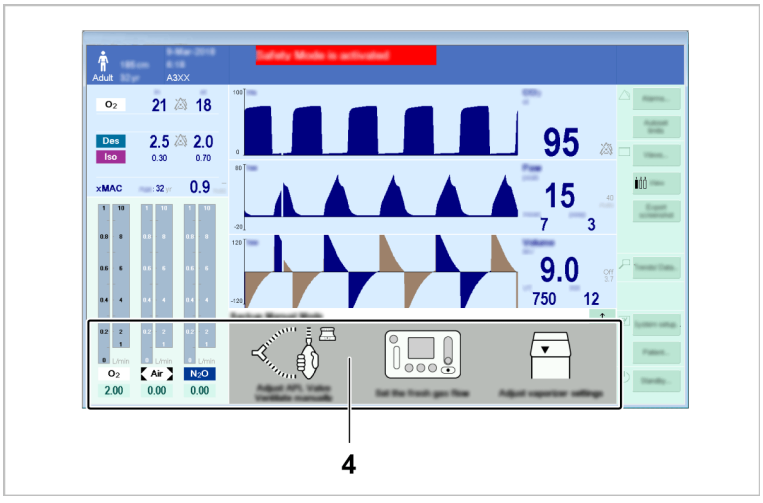
2. Activate the backup manual switch (2). Follow the instructions on the product label (3) or the screen (4).



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3. Ventilate the patient manually.
   a. During mechanical ventilation or in the ***Man/Spon*** ventilation mode:
      Ventilate manually with the breathing bag.
   b. When using the external fresh-gas outlet:
      Ventilate manually with the breathing bag on the non-rebreathing system.
4. Set the fresh-gas flow.
5. Check the vaporizer setting.

3.2.12.3 Overview

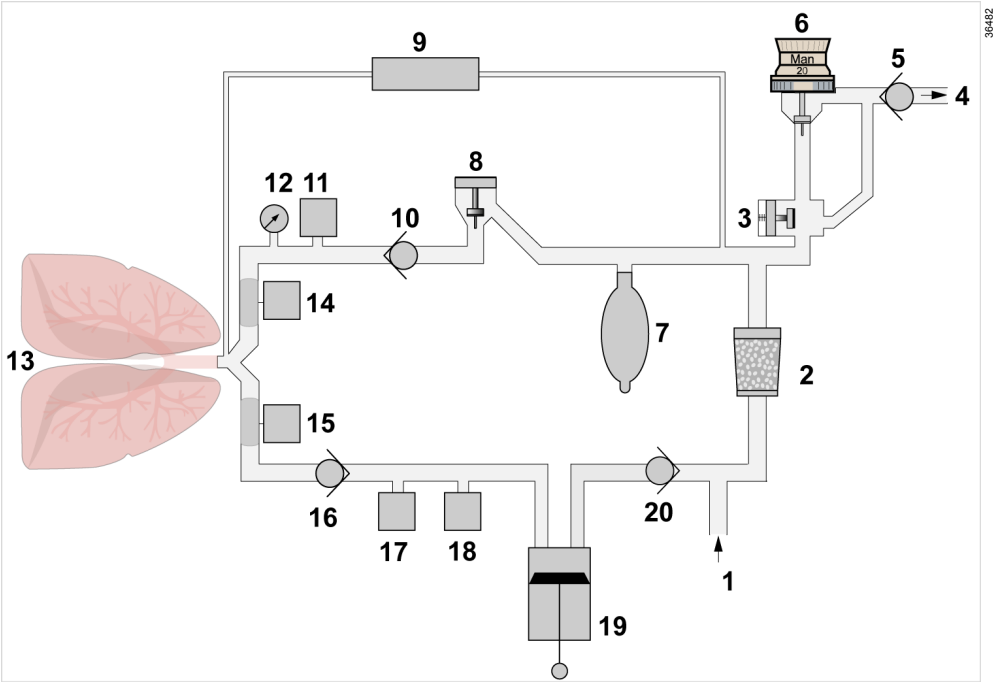
The following table gives an overview of the integrated safety functions which come into effect if problems occur during operation:

Fault	Safety function
Leakage	Automatic leakage compensation – The pressure is held constant at the PEEP level. – With pressure-controlled breaths, the pressure is regulated according to the set pressure. (In all pressure-controlled ventilation modes, small amounts of leakage are compensated by the piston drive.)
Mains power supply failure	Uninterruptible power supply provided by internal battery – Battery operation possible for at least 45 minutes, typically 150 minutes – Automatic deactivation of the breathing system warmer to increase battery runtime
Mains power supply failure and battery discharged	– Manual ventilation and spontaneous breathing are available – Emergency O_2 delivery (electronically controlled gas mixer) – Fresh-gas delivery (mechanically controlled gas mixer) – Delivery of anesthetic agents via connected vaporizers
Failure of the central gas supply system	– Use of the connected gas cylinders
Complete failure of the gas supply	– Mechanical ventilation with ambient air possible (the hose with the breathing bag will have to be removed for this) – No anesthetic agent delivery from the connected vaporizers possible; switch to intravenous anesthetic agent required
Flow measurement failure	– Mechanical ventilation can be continued. – Limitations with regard to displayed measured values, measurement accuracies, and when triggering mandatory breaths are possible.
Failure of fresh-gas delivery (electronically controlled mixer only)	– Emergency O_2 delivery For further information see: "Backup manual mode", page 38. – Anesthetic agent delivery from connected vaporizers possible – All ventilation modes are available. Alternatively: – Backup manual mode

Fault	Safety function
Ventilator failure	– Manual ventilation or spontaneous breathing possible – Fresh-gas delivery available – Anesthetic agent delivery from connected vaporizers possible Alternatively: – Backup manual mode
Screen fault (screen does not respond to operation or has failed)	If backup manual mode is activated: – Manual ventilation or spontaneous breathing possible – Emergency O_2 delivery (electronically controlled gas mixer) or fresh-gas delivery (mechanically controlled gas mixer) available – Anesthetic agent delivery from connected vaporizers possible
Complete device failure	If backup manual mode is activated: – Manual ventilation or spontaneous breathing possible – Emergency O_2 delivery (electronically controlled gas mixer) or fresh-gas delivery (mechanically controlled gas mixer) available – Anesthetic agent delivery from connected vaporizers possible

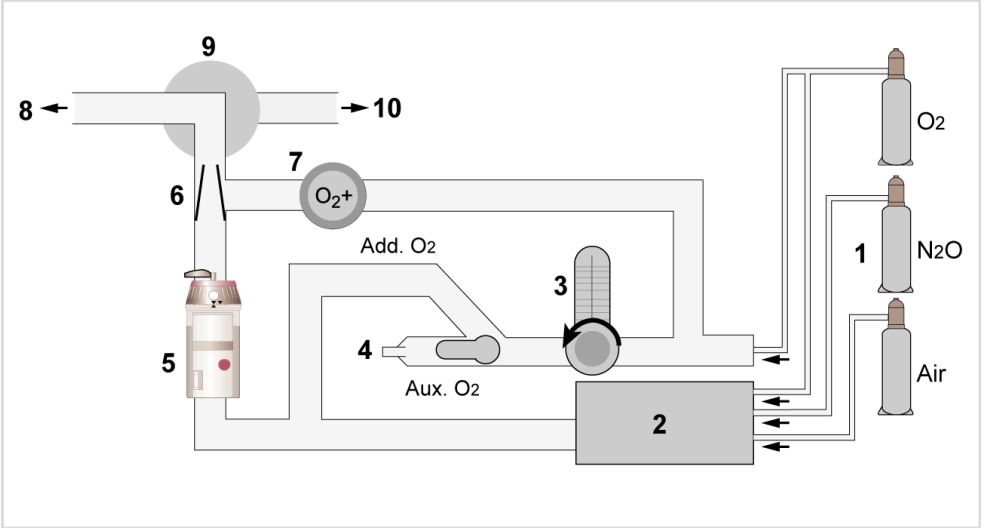
3.3 Gas flow diagram

3.3.1 Breathing system



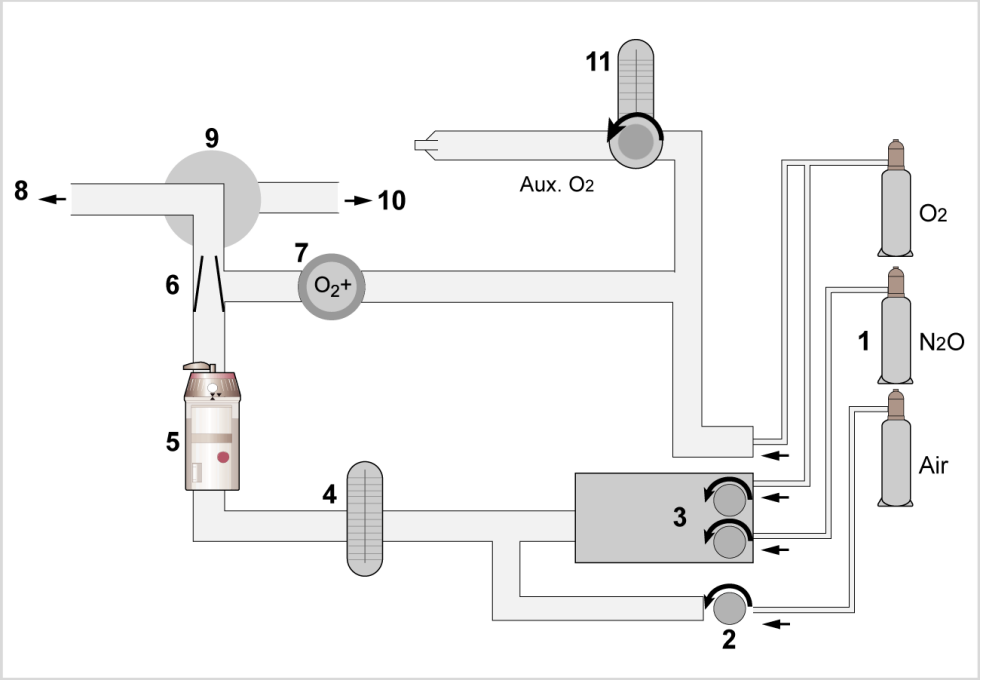
No.	Designation
1	Fresh gas (O_2, Air, N_2O) and anesthetic gas
2	CO_2 absorber
3	Changeover between mechanical ventilation and ***Manual / Spontaneous***
4	Anesthetic gas receiving system
5	Anesthetic gas scavenging valve
6	APL valve
7	Breathing bag
8	PEEP/Pmax valve
9	Patient-gas measurement module
10	Expiratory valve
11	Expiratory pressure measurement
12	Pressure gauge (option)
13	Patient
14	Expiratory flow sensor
15	Inspiratory flow sensor
16	Inspiratory valve
17	Inspiratory pressure measurement
18	Inspiratory O_2 sensor
19	Ventilation drive
20	Fresh-gas decoupling valve

3.3.2 Gas supply (electronically controlled gas mixer)



No.	Designation
1	Gas supply (central supply or gas cylinders)
2	Gas mixer
3	O_2 flowmeter
4	O_2 switch
5	Vaporizer
6	Ejector
7	O_2 flush
8	Breathing system
9	Switch-over valve
10	External fresh-gas outlet

3.3.3 Gas supply (mechanically controlled gas mixer)



No.	Designation
1	Gas supply (central supply or gas cylinders)
2	Flow control valves
3	Minimum O2 delivery
4	Total flow tube
5	Vaporizer
6	Ejector
7	O2 flush
8	Breathing system
9	Switch-over valve
10	External fresh-gas outlet
11	O2 flowmeter (option)

4 Assembly and preparation

4.1 Safety instructions

Hoses, filters, cables, and breathing bags

Additional components or certain hose configurations may alter the values for leakage, compliance, and inspiratory and expiratory resistances and thus affect the therapy. Consequently, the patient may be put at risk, e.g., the tidal volume may deviate.

► When using configurations that deviate from a standard breathing circuit, the user must pay particular attention to the measured values.

► Perform a leakage test after replacing breathing hoses, particularly extendable hoses, vaporizers, soda lime, or other components.

► Perform a leakage test after changing the length of extendable hoses.

► Do not use extendable hoses to ventilate neonates.

As a result of leakage, ambient air may get into the breathing gas, breathing gas may escape, or contamination of the connected central supply may occur.
The patient or the user may be put at risk due to the following:

– Reduction of the depth of anesthesia
– Incorrect gas measurements
– The applied volume is less than the set volume.
– Accumulation of anesthetic gas in the ambient air
– Contamination of the supply gases
– The sample line is damaged.
– The CO_2 absorber is incorrectly locked in place.

► Connect the sample line correctly.

► Perform the leakage test before using the device. Rectify the leakage or reduce it to a minimum.

► If the central supply fails during operation, disconnect the hoses for the failed gas from the central supply.

► After mounting and replacing, make sure the CO_2 absorber is firmly locked into place.

Leakage in the inner hose of a coaxial breathing circuit may result in rebreathing CO_2 or inadequate gas exchange. The device can only detect such leakage if a separate test with a coaxial test adapter is performed.

► Check the inner hose for leakage. With Dräger hoses, use the appropriate test adapter. Next, perform a leakage test on the entire breathing circuit. Observe the following information: "Checking a coaxial breathing circuit", page 132.

► Monitor the measured gas concentrations during ventilation.

CO_2 absorber

Moisture losses occur if fresh gas is continuously passed through the soda lime. If the moisture falls below the minimum level, the following adverse reactions occur regardless of the type of soda lime and inhalational anesthetic agent used:

– Reduced CO_2 absorption and consequently an increase in inspiratory CO_2 values
– Increased generation of heat in the CO_2 absorber and consequently increased breathing gas temperature
– Formation of carbon monoxide
– Absorption and/or degradation of the inhalational anesthetic agent

► Check the soda lime for color changes regularly and replace if necessary, especially if the inspiratory CO_2 value increases unexpectedly.
► Do not use unnecessarily high fresh-gas flows.
► Only use the O_2 flush when it is required.
► With electronically controlled gas mixer:
Only use the emergency O_2 delivery when it is required.
► With mechanically controlled gas mixer:
Do not leave the flow control valves open for an unnecessarily long period of time.
► Use a suitable soda lime such as Drägersorb Free. Do not use any soda lime based on potassium hydroxide.

Soda lime is caustic and is a strong irritant for eyes, skin, and airway.

► Handle the soda lime carefully and do not spill it.

Water trap and integrated patient-gas measurement module

Due to the technical characteristics of gas measurement, the measured gas values might be inaccurate at high respiratory rates and certain I:E ratios. As a result, the patient could be put at risk.

► Pay attention to the technical data for gas measurement.

Contaminants, aerosol propellants, damage, or overfilling of the water trap can impair gas measurement. This may result in inadequate ventilation and the patient may be put at risk.

► Check the water level in the water trap regularly and empty or replace the water trap if necessary.
► Do not use medication nebulizers.
► Follow the instructions for use of the water trap.
► A device equipped with an integrated patient-gas measurement module must always be operated with a water trap fitted to the patient-gas measurement module.

Silicone residues or aerosol residues in the water trap can get into the measuring cuvette. As a result, the measurement may be compromised or a fire could start, putting the user and patient at risk.

► Do not spray the O-rings of the water trap holder with silicone spray.

4.1.1 Electrical safety

Ambient conditions

If the device is operated or connected to the mains power supply at ambient temperatures above 35 °C (95 °F), the battery cannot be charged properly. The power supply out of the battery may be limited. As a result, the patient could be put at risk.

► Do not expose the device to temperatures above 35 °C (95 °F) on a permanent basis.

Mains power supply

If the device is connected to a power socket with incorrect mains voltage or a power socket without a protective ground conductor, an electric shock may occur. Connecting the device to auxiliary power sockets can lead to an increased leakage current. This may result in an electric shock and the user and patient may be put at risk.

► Connect the device only to power sockets with correct mains voltage and a protective ground conductor.

► Do not connect the device to additional power socket strips.

Battery supply

If the battery is not sufficiently charged, it may not be possible to maintain operation for long enough if the mains power supply fails. If there is a mains power supply failure, devices connected to the auxiliary power sockets are not supplied from the internal battery. As a result, the patient could be put at risk.

► Before first operation or after storage, charge the battery for at least 8 hours.

► Check the functional integrity of the battery by performing regular inspections.

Auxiliary power sockets

The connection of devices to auxiliary power sockets can lead to an increased leakage current. If the protective ground conductor of one of these devices fails, the leakage current may rise above the permissible values. This may result in an electric shock or device failure and the patient and user may be put at risk.

► Do not connect additional power socket strips to the integrated auxiliary power sockets on the device, but rather to separate power sockets on the wall.

► Have the leakage current checked by service personnel.

► If the permissible value is exceeded, use separate power sockets on the wall instead of the auxiliary power socket on the device.

► Do not connect high-frequency surgery equipment to the auxiliary power sockets of the anesthesia machine.

► When making a connection, follow the manufacturer's instructions for all connected devices.

Interfaces

Connecting devices to the data interfaces (serial ports and network ports) can lead to an increased leakage current. If the protective ground conductor of one of these devices fails, the patient leakage current may rise above the permissible values. This may result in an electric shock and the user and patient may be at risk.

- ► Only use USB devices that do not have their own power supply.
- ► Only connect devices or networks to a serial port, or to the network port, that have a maximum nominal voltage of 24 V DC and meet one of the following standards:
  - – IEC 60950-1: Ungrounded SELV circuits
  - – IEC 60601-1 (as of 2nd edition): Touchable secondary circuits
- ► Have the leakage current checked by service personnel.
- ► If the permissible value is exceeded, disconnect the devices from the serial ports.
- ► Do not touch the interface ports and the patient simultaneously.

4.1.2 Explosion protection

Flammable gases

In combination with oxygen or nitrous oxide, ignition sources such as electrosurgery, laser surgery, and faulty cables or connectors can cause fires. As a result, user and patient could be put at risk.

- ► This device is not approved for use in areas where oxygen concentrations greater than 25 Vol%, combustible, or explosive gas mixtures are likely to occur.
- ► Maintain a distance of at least 200 mm (7.9 in) between electrical connections and components which conduct oxygen and nitrous oxide.
- ► Cables and connections must be sufficiently insulated and must not be damaged. Check cables for damage daily.
- ► Disconnect all oxygen feeds if oxygen leakage is suspected in the device or its vicinity. Do not operate the device, and contact service personnel.
- ► Keep ignition sources away from the device.

Flow sensors

Residues which are not removed during reprocessing can damage the measuring wires in the flow sensor or cause fire. As a result, user and patient could be put at risk.

- ► Check the flow sensor before insertion and at regular intervals afterwards for visible damage, soiling, and particles.
- ► Replace flow sensors when damaged, soiled, or not particle-free.

Drugs or other substances based on readily flammable substances may be ignited by the flow sensor. As a result, user and patient could be put at risk.

- ► Do not nebulize drugs or other substances based on readily flammable substances or spray them into the device.
- ► Do not use any substances containing alcohol.
- ► Do not allow any combustible or explosive substances to get into the breathing system or the breathing circuit.
- ► Do not use cyclopropane or ether.

Pressure reducers

Pressure reducers have an internal pressure release valve. If a fault occurs, gas may escape into the ambient air. Personal injury or property damage may result as a consequence.

► Do not block or cover the pressure release valve.

4.1.3 Mechanical safety

Accessories

If the weight of the accessories is unevenly distributed on the device or exceeds the permissible limits, the device may tip over. The end stops of the support arms in use must be functional, otherwise the arms may swing unchecked.

► Distribute the weight evenly.
► Pay attention to the maximum weight on each support arm.
► Check whether the optional counterweight in the lower section of the trolley is required (see "Compact version with counterweight", page 54).
► Check the functional integrity of the support arm end stops after the following activities:
  – After fitting accessories
  – After transporting the device

Trapping of body parts

Movable components or attached parts may cause crushing due to trapping. Pay special attention to edges, movable parts, and corners when working with the following components:

► Breathing system cover
► Drawers
► Folding table extension
► Pull-out writing tray
► Support arms for mounted devices
► Accessories such as gas cylinders, vaporizers, CLIC absorbers, and CLIC adapters

Accidental movement of the trolley

An unbraked device may accidentally move during operation. As a result, user and patient could be put at risk.

► Prevent this by actuating the central brake or the castor brakes, and check their function.

Strangulation

Negligent placement of hoses, cables, and similar device components can put the patient at risk.

► Use particular caution when establishing connections to the patient.

Transport

If the device collides with an obstacle during transport, the pressure reducers may be damaged. Take the following measures before transporting:

► Align the pressure reducers so that they are protected from collisions.

► Close the valves on the gas cylinders.

During transport, the device may tip over due to incorrect handling or carelessness. Personal injury or property damage may result as a consequence.

► To push or pull the device, hold it by the standard rail with the handle (right-hand side of device).

► The device may only be moved by persons who have the physical ability to do so.

► Always have the device moved by 2 persons for better maneuverability and when it is being transported over sloping surfaces.

► When the device is moved over inclines, around corners, or over thresholds (e.g., through doors or in elevators), make sure that it does not bump against anything.

► Do not pull the device over hoses, cables, or other obstacles lying on the floor.

► Do not operate either the central brake or any of the castor brakes while the device is being moved.

► Do not lean against the device.

4.1.4 Color codes and labels

If the vaporizer is filled with the wrong anesthetic agent or if the filling level is too low, incorrect anesthetic gas concentrations or concentrations that are too low can occur as a result.

► Compare the color code and labeling on the vaporizer used with the anesthetic agent bottle and the anesthetic agent indicated on the screen.

4.1.5 Gas supply

All gas supplies (central supply, gas cylinders) must be correctly connected since otherwise the backup system (gas cylinders) will not be available if the gas supply fails. Other devices, e.g., a bronchial suction system, which are connected to the gas outlets of the device, will no longer be supplied with gas. As a result, the patient could be put at risk.

► Make sure that all compressed gas hoses are correctly connected to the rear side of the device.

► After connecting the gas supplies, ensure their functional integrity. Set the supply pressure from the gas cylinders in accordance with the specifications on the device.

► Even when the device is connected to the central supply, the gas cylinders should remain by the device with valves closed as backup.

► Always monitor the gas supply to connected devices independently of the main device.

Devices connected to the gas supply may be damaged by inadequate gas quality. The use of non-medical gas can result in gas compositions that impair the functional integrity of the device.

► Use only medical gases.

► Follow the national and international standards regarding the use of medical gases.

Impermissible supply pressures or using oxygen supplies with less than 100 % O_2 may cause incorrect gas composition. As a result, the patient could be put at risk.

► Check the supply pressures of the central supply and of the gas cylinders before operation.

► When using O_2, use only 100 % O_2.

The following effects may occur when using O_2 concentrators and may put the patient at risk:

– Deviations between the set value and the actual value for fresh-gas flow and O_2 concentration in the fresh gas

– Inaccurate measured values for volume, anesthetic agent consumption, econometer, and low-flow wizard

– Accumulation of argon in low-flow operation and minimal-flow operation

► Do not use any O_2 concentrators.

A failure of the gas supply can result in a risk of patient injury. In the following cases, the availability of the gas cylinders cannot be monitored and the backup functionality may be put at risk:

– Instead of a Dräger pressure reducer, a pressure reducer without the required pressure sensor is used.

– A central supply hose is connected to the connector for the compressed gas cylinders.

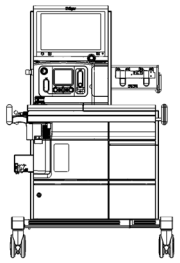
► If monitoring of the gas cylinders is not available, suitable pressure monitoring conforming to ISO 80601-2-13 must be used. This will allow the user to read the cylinder pressures from the user's operating location.

► Do not connect central supply hoses to the connectors for gas cylinders.

4.2 Mounting of accessories

Information on the mounting of accessories is described in the assembly instructions.

4.2.1 Large version



The maximum total weight of the accessories is 45 kg (99 lbs).

The weight is distributed as follows:

Column cover

The column cover may be loaded with a maximum of 15 kg (33 lbs).

Left and right sides

Mounting position	Maximum weight	Additional restrictions
All accessories on a single arm	25 kg (55 lbs)	Maximum arm length: 75 cm (29 in)
Accessories distributed over several arms on both sides	40 kg (88 lbs)	Maximum arm length: 40 cm (16 in)
Accessories on both sides, distributed over 2 arms	15 kg (33 lbs) per arm	Maximum arm length: First arm: 75 cm (29 in) Second arm: 40 cm (16 in)
Accessories that are not mounted on arms	See product label	Maximum distance to the device: 10 cm (4 in)

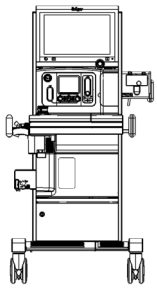
Rear

The rear may be loaded with a maximum of 40 kg (88 lbs). In addition to the accessories, this must also take account of the weight of gas cylinders including the pressure reducers and the hanger yoke system.

Other components

Component	Maximum weight
Writing tray	20 kg (44 lbs)
Standard rail	10 kg (22 lbs)
Large drawer	3 kg (6.6 lbs)
Small drawer	2 kg (4.4 lbs)

4.2.2 Compact version



The maximum total weight of the accessories is 30 kg (66 lbs).

The weight is distributed as follows:

Column cover

The column cover may be loaded with a maximum of 15 kg (33 lbs).

Left and right sides

Mounting position	Maximum weight	Additional restrictions
All accessories on a single arm	15 kg (33 lbs)	Maximum arm length: Left side: 75 cm (29 in) Right side: 40 cm (16 in)
Accessories that are not mounted on arms	See product label	Maximum distance to the device: 10 cm (4 in)

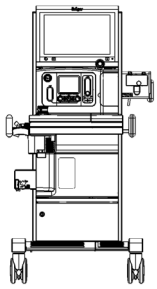
Rear

The rear may be loaded with a maximum of 40 kg (88 lbs). In addition to the accessories, this must also take account of the weight of gas cylinders including the pressure reducers and the hanger yoke system.

Other components

Component	Maximum weight
Writing tray	20 kg (44 lbs)
Standard rail	10 kg (22 lbs)
Large drawer	3 kg (6.6 lbs)

4.2.3 Compact version with counterweight



There is a counterweight of 30 kg (66 lbs) fitted in the lower section of the trolley. Thus the maximum total weight of the accessories rises to 45 kg (99 lbs).

The weight is distributed as follows:

Column cover

The column cover may be loaded with a maximum of 15 kg (33 lbs).

Left and right sides

Mounting position	Maximum weight	Additional restrictions
All accessories on a single arm	20 kg (44 lbs)	Maximum arm length: 75 cm (29 in)
Accessories distributed over several arms on both sides	30 kg (66 lbs)	Maximum arm length: 40 cm (16 in)
Accessories that are not mounted on arms	See product label	Maximum distance to the device: 10 cm (4 in)

Rear

The rear may be loaded with a maximum of 40 kg (88 lbs). In addition to the accessories, this must also take account of the weight of gas cylinders including the pressure reducers and the hanger yoke system.

Other components

Component	Maximum weight
Writing tray	20 kg (44 lbs)
Standard rail	10 kg (22 lbs)
Large drawer	3 kg (6.6 lbs)

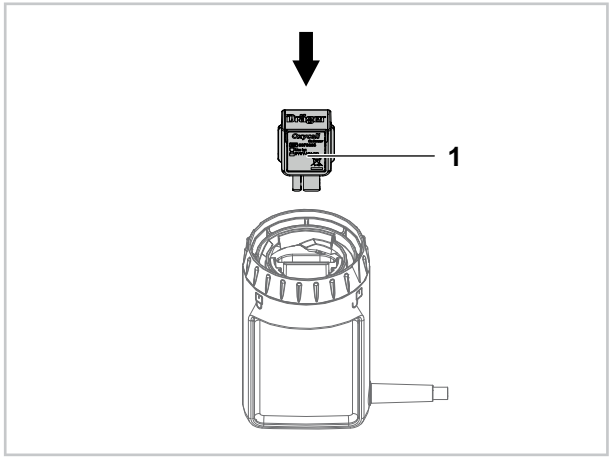
4.3 Before first operation

ℹ The breathing system must be reprocessed before the device is operated for the first time.

4.3.1 Inserting the O_2 sensor cell

If the device is equipped with an O_2 sensor, an O_2 sensor cell must be inserted into the O_2 sensor.

1. Disassemble the O_2 sensor (see "Disassembling the O_2 sensor", page 233).
2. Insert the new O_2 sensor cell (1) into the O_2 sensor.



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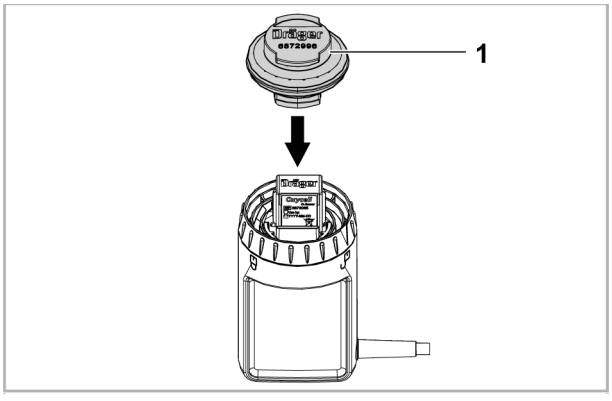
ℹ After the O_2 sensor cell has been inserted, the initialization phase of the O_2 sensor takes place. The initialization lasts 30 minutes. The 30 minutes start when the mains power supply is established.

4.3.2 Assembling and inserting the O_2 sensor

1. Place the sensor cap (1) on the O_2 sensor.



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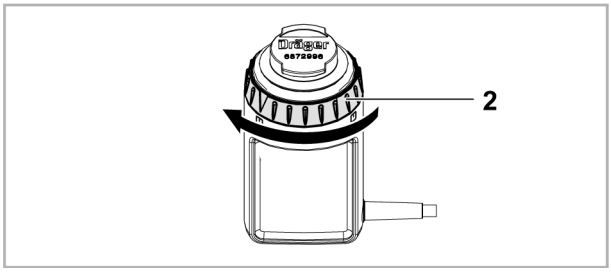
2. Turn the knurled nut (2) about 90° clockwise. Turn it until the palpable resistance is overcome and a click is heard. The sensor cap is now fitted.



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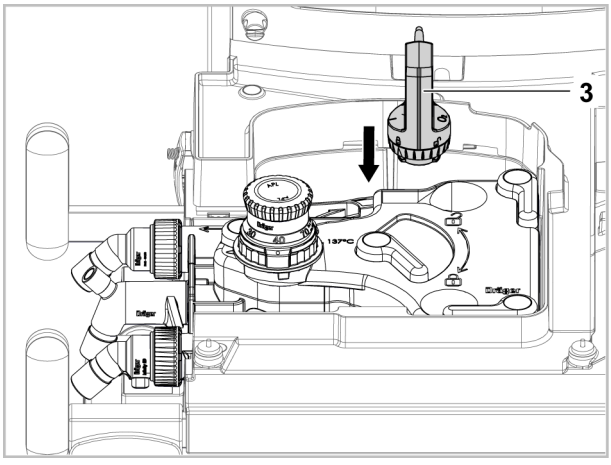
3. Insert the O_2 sensor (3) into the sensor port.



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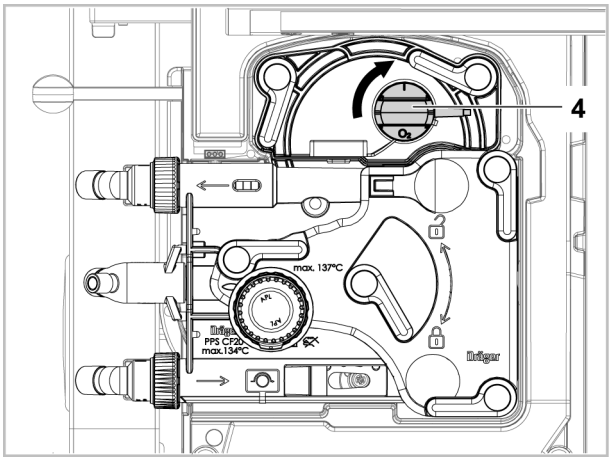
4. Turn the O_2 sensor (4) clockwise.



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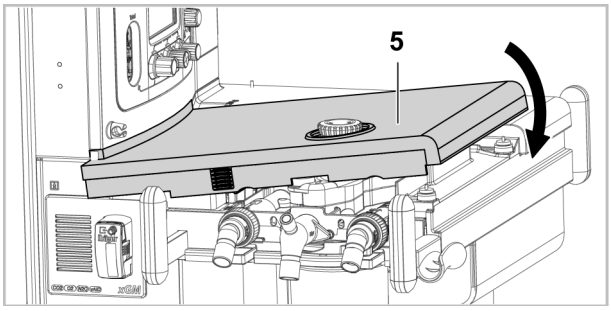
5. Put the breathing system cover (5) in place and click it into position.



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4.3.3 Establishing the mains power supply

The mains voltage must correspond to the voltage range indicated on the rating plate on the rear of the device.

To protect from inadvertent disconnection of the power cable, the power inlet of the device is secured with a guard plate.

1. ⚠ **WARNING**
   Risk due to incorrect mains voltage or missing protective ground conductor
   If the device is connected to a power socket with incorrect mains voltage or a power socket without a protective ground conductor, an electric shock may occur.
   ► Connect the device only to power sockets with correct mains voltage and a protective ground conductor.

   ⚠ **WARNING**
   Risk of electric shock
   If the device is connected to an additional power socket strip, this may lead to increased leakage current. The leakage current may exceed the permissible values.
   ► Do not connect the device to additional power socket strips.
   ► Do not connect additional power socket strips to the integrated auxiliary power sockets on the device, but rather to separate power sockets on the wall.

   Plug the power plug into the power socket.

   ℹ The power plug must be readily accessible so that the power supply to the device can be interrupted quickly in the event of a device malfunction.
2. Using the symbols on the status display, check that the power supply is established.
3. Turn on the device.

4.3.4 Charging the battery

The internal battery will automatically start charging as soon as the device is connected to the mains power supply.

4.3.5 Connecting other devices to the auxiliary power sockets

An illustration of the auxiliary power sockets can be found on page 28.

1. Connect the power cable of the other device to an auxiliary power socket.

Make sure that the maximum current consumption of the other devices does not exceed the permissible value.

⚠ WARNING
Risk of fire
Components such as power supply units that heat up are unable to cool down in enclosed storage locations and may cause a fire.

► Do not keep components that heat up in the drawers or in the storage compartment at the rear of the device.

4.3.6 Establishing potential equalization

Differences in electrical potential between devices can be reduced by potential equalization.

Potential equalization does not replace the connection with protective ground conductor.

During operation, the potential equalization connector must be readily accessible and the potential equalization cable must be removable without tools.

4.3.6.1 Connecting the potential equalization cable

– Connect the potential equalization cable to the potential equalization pin on the device (see "Connectors", page 25).
– Connect the potential equalization cable to a potential equalization connector of the hospital (e.g., wall, ceiling supply unit, operating table).

4.3.7 Connecting devices to the data interfaces

This device is equipped with data interfaces such as LAN and RS232. These interfaces can be used to set up an IT network in accordance with IEC 60601-1.

4.3.7.1 Establishing a data connection

► **⚠ WARNING**
Risk of overloading the network
The following hazardous situations may occur if the network does not possess the required characteristics:

► Exported patient-related data (age, weight, height) and therapy-related data may be intercepted, falsified, or damaged.
► An overload of the device due to high network load (e.g., caused by denial-of-service attacks) may lead to a shut-down of the device's network port. The network port will not be available again until the device is restarted.

Connect the device to a network or a computer.

An illustration of the ports can be found on page 25.

To use the anesthetic gas compensation - see page 98 - connect an anesthetic gas monitor to the COM 2 port.

Only use the cables from the list of accessories.

For further information on configuring the particular interface, see page 179.

4.4 Intrahospital transport

Transport includes any movement of the device to other rooms or functional areas. Alignment or positioning of the device within the operating room is not counted as transport.

4.4.1 Increasing the tipping stability during transport

1. Carefully fold the arms with any mounted accessories against the device, (e.g., patient monitor, data management system, syringe pumps).
2. Use a strap to prevent the arms from swinging out in an uncontrolled manner.
3. Remove all loose objects from the attached arms and the shelves.
4. Remove all objects weighing more than 8 kg from the rails.
5. Remove the vaporizers.
6. Remove all objects from the writing tray and the work surface.
7. Slide the writing tray completely into the device.
8. Position the breathing bag arm (if present) close to the device.
9. Push in and lock the drawers (if present).

4.4.2 Parking the medical device

When parking, always engage the brakes (central brake for front castors and castor brake at rear), especially on inclined surfaces.

4.4.3 Visual inspection after transport

1. Check the device for damage, particularly the hoses and cables.
2. Do not operate a damaged device. The damage must be repaired by service personnel before the device is used.

4.5 Gas supply

4.5.1 Connecting to the central gas supply system

1. Screw the compressed gas hoses for the central gas supply system to the gas inlets by hand, see page 26.
2. ⚠ **WARNING**
   Danger to the patient and user
   If the strain relief for the compressed gas hoses is not used, the device may be damaged.
   ► Use the strain relief for the compressed gas hoses.

   Insert the compressed gas hoses into the strain relief. Tighten the strain relief, see page 23.

3. Connect the compressed gas hoses to the terminal units.
4. Check if all hoses are correctly connected. Using the symbols on the status display, check that the gas supply is established (see page 29).

4.5.2 Connecting the gas cylinders

The connectors on the gas cylinders and pressure reducers must be undamaged and free from dust, particles, and grease. Otherwise, there is risk of fire.

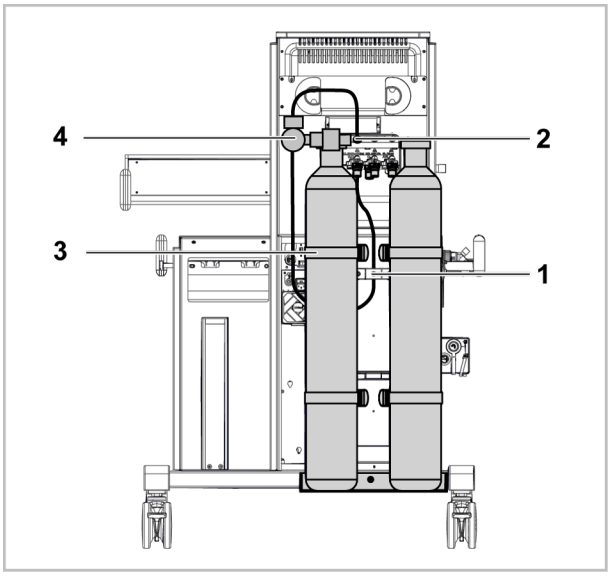
When handling pressure reducers, follow the relevant national laws and regulations.

4.5.2.1 Connecting gas cylinders with screw connections

1. **⚠ WARNING**
   Danger to the patient and user
   If the strain relief for the compressed gas hoses is not used, the device may be damaged.
   ► Use the strain relief for the compressed gas hoses.

   ⚠ WARNING
   Risk of fire
   Ignition sources together with oxygen can cause fires.
   ► Do not position oxygen sources in the vicinity of ignition sources, e.g., electrical connectors.
   ► Always fit the oxygen cylinder in the right-hand fixing position on the rear.

   Insert the compressed gas hoses into the strain relief (1). Tighten the strain relief.



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2. Check that the pressure measuring lines above the gas inlets are correctly connected (2).
3. Place the gas cylinders (3) in the gas cylinder holders. Secure with hook-and-loop straps.

4. **⚠ WARNING**
   Risk of personal injury and damage to the device
   Pressure reducers have an internal release valve. If a fault occurs, gas may escape into the ambient air.
   ► Do not block or cover the release valve.

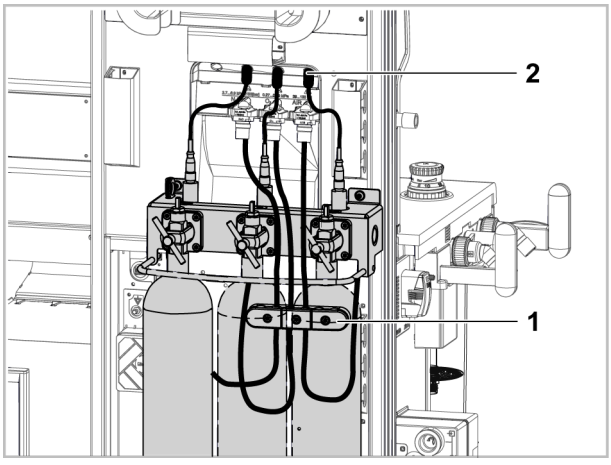
   NOTICE
   Risk of damage to the device
   ► When connecting the pressure reducers, ensure that they do not protrude beyond the device.

   Tightly screw the pressure reducers (4) to the gas cylinder valves. The connectors must fit each other directly. Do not use an adapter.

4.5.2.2 Connecting suspended gas cylinders with pin-index connectors

Before first use

1. Insert the compressed gas hoses into the strain relief (1) on the rear of the device. Tighten the strain relief.



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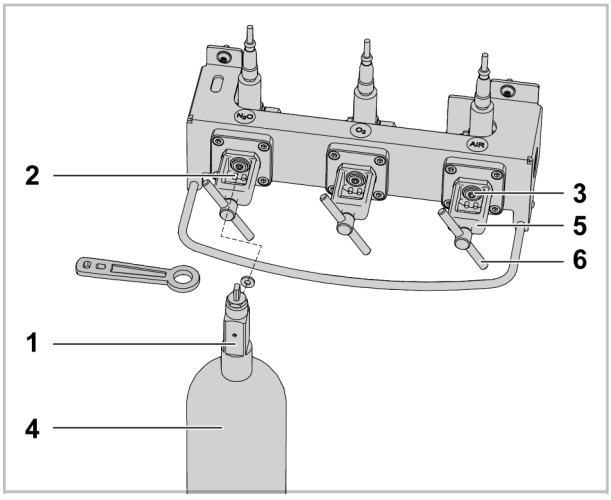
2. Connect the pressure measurement lines to the connectors (2).
3. The gas cylinder holder can be fastened at 2 different heights (not shown in this illustration). Adjust the position of the gas cylinder holder to the size of the gas cylinder in use. Contact service personnel to do this.

Fitting the gas cylinders

1. Remove the protection cap from the head of the cylinder (1).



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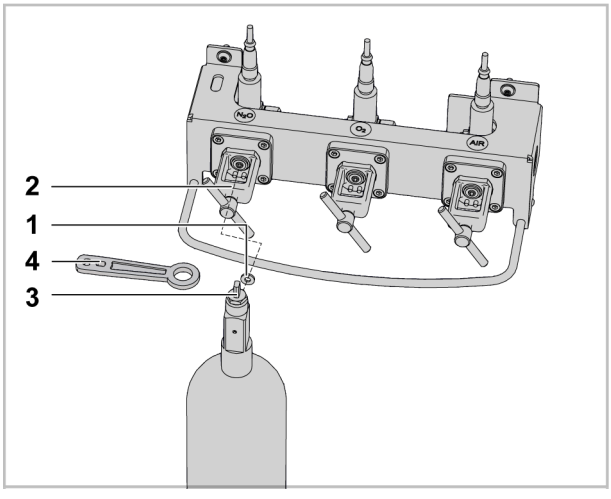
2. Make sure that both pin-index pins (2) are present below the gas inlet (3).
3. Align the gas cylinder (4) so that the pin-index holes on the head of the cylinder (1) are pointing towards the pin-index pins (2).
4. Insert the head of the cylinder (1) into the cylinder holder (5) from below.
5. Allow the pin-index pins (2) to engage in the pin-index holes.
6. Turn the handle (6) clockwise until the threaded stud is slightly screwed into the visible recess on the head of the cylinder.
   Align the gas cylinder (4) so that it is hanging vertically.
7. Tighten the handle (6).
8. Secure the gas cylinders (4) with hook-and-loop straps (not shown here).

Replacing the gas cylinder

1. Remove the old sealing washer (1).



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2. Insert a new sealing washer (1) on the cylinder holder (2).
3. Continue with fitting the gas cylinders, see "Fitting the gas cylinders".

If required, the gas cylinder valve (3) can be opened with the supplied wrench (4).

4.5.2.3 Handling O_2 gas cylinders

► **⚠ WARNING**
Risk of explosion
When pressurized, O_2 is self-igniting in combination with oil or grease.
► Do not oil or grease the gas cylinder valve or the pressure reducer on the O_2 cylinder. Do not touch with oily or greasy fingers.

The gas cylinder valves must only be opened and closed slowly. Do not use any tools with the screw connection variants.

Have service personnel replace any leaky or stiff gas cylinder valves.

4.5.3 Fitting the vaporizers

The device can be operated with vaporizers which have a Dräger Auto Exclusion plug-in adapter or a Selectatec plug-in adapter. Dräger recommends using only vaporizers that are listed in the list of accessories and have been tested.

The vaporizers used must conform to the ISO 8835-4 or ISO 80601-2-13 standard.

The illustration shows vaporizers of the type Dräger-Vapor 3000.

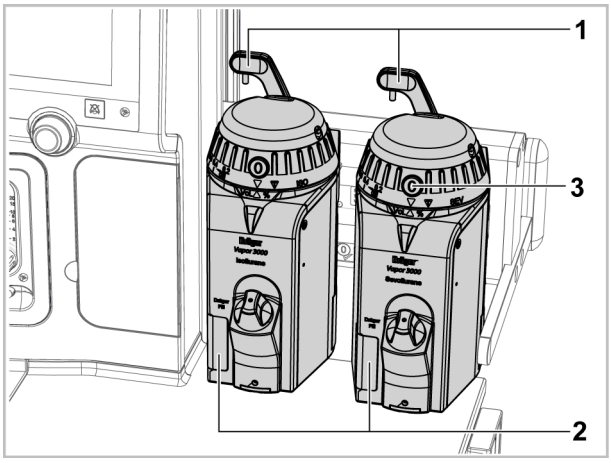
Connecting the vaporizers

⚠ WARNING
Risk due to improperly mounted vaporizers
Incorrectly mounted vaporizers can cause leakage. This can cause the fresh-gas delivery to be too low or contaminate the ambient air. Patient and user can be endangered.
► Make sure that the connected vaporizers are hanging vertically.
► When using D-Vapor vaporizers, make sure that the power cable is not pinched.
► After mounting the vaporizers, perform a leakage test.

1. Set all the vaporizers upright and securely on the plug-in adapter.

2. Turn the locking levers (1) clockwise. The vaporizers are locked when the levers are pointing to the left.

   The illustration shows vaporizers of the type Dräger-Vapor 3000.



3. **⚠ WARNING**
   Risk due to incorrect anesthetic agent delivery
   If the vaporizer is filled with the wrong anesthetic agent or if it is not filled sufficiently, incorrect anesthetic gas concentrations or concentrations that are too low can occur as a result.
   ► Compare the color code and labeling on the vaporizer used with the anesthetic agent bottle.
   ► Follow the instructions for use for the vaporizer.

   Check the filling levels in the sight glasses (2). Fill the vaporizers if required.
4. Turn the control dial on each vaporizer to the ***0*** position. The key (3) engages.

Checking the metering interlock

The vaporizers have an interlock system which by means of a metering interlock prevents the simultaneous opening of 2 vaporizers.

1. Turn the control dial on one of the vaporizers to a position other than ***0***.
2. Test the control dials of the other vaporizers to see if they can be turned. The metering interlock is active if the control dial remains in the ***0*** position.
3. Turn the vaporizer opened in step 1 back to the ***0*** position.
4. Repeat this test for all the vaporizers.

Special characteristics of the D-Vapor

1. Connect the power cable to a power socket.
2. If required, establish a potential equalization connection.
3. Stow the cable in a cable duct if necessary.

4.6 Connecting to the gas scavenging system

The device is equipped with an active or a passive anesthetic gas receiving system (AGS).

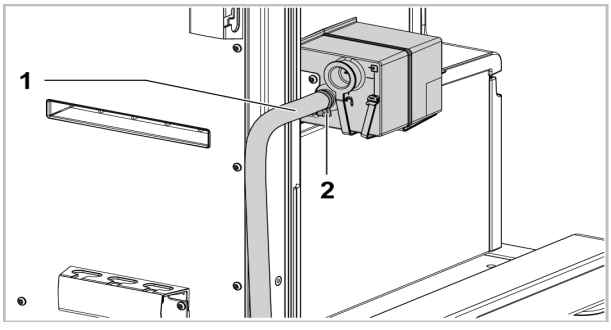
The active anesthetic gas receiving system can be combined with a control valve or an ejector. Follow the relevant assembly instructions.

► Make sure that the ventilation slots on the underside of the AGS are not blocked.

4.6.1 Active anesthetic gas scavenging

1. ⚠ **CAUTION**
   Risk of ambient air contamination
   If the anesthetic gas receiving system is not connected to the disposal system, contamination of the ambient air with anesthetic gas may result.
   ► Connect the anesthetic gas receiving system correctly to the disposal system.

   Connect the scavenging hose (1) to the nozzle on the AGS.



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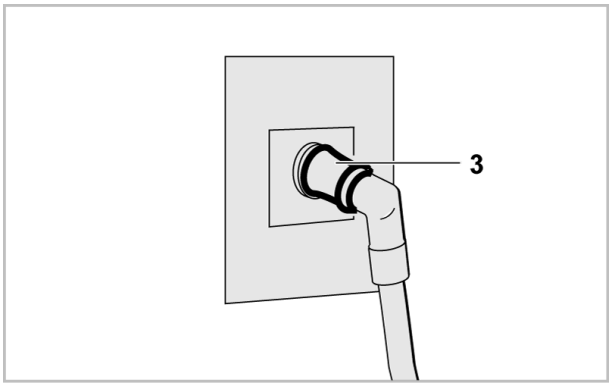
2. Secure the scavenging hose with the clip (2).
3. Connect the gas probe of the scavenging hose to the terminal unit (3) of the disposal system.



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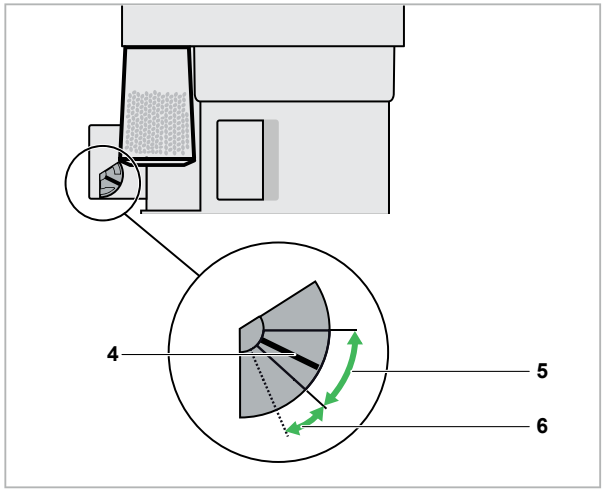
4. Check the flow indicator.



If the flow indicator (4) is floating in the normal range (5), the anesthetic gas scavenging system is functional.
If the flow indicator is floating in the restricted range (6), certain fresh-gas flows should not be exceeded, see "Anesthetic gas receiving system" in chapter "Technical data".

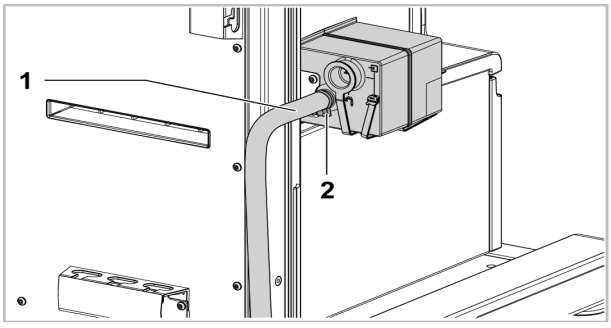
4.6.2 Passive anesthetic gas scavenging

1. ⚠ **WARNING**
Risk of negative pressure
If a passive AGS is connected to an active anesthetic gas scavenging system, a negative pressure may arise in the patient's lungs.
► Connecting a passive AGS to an active anesthetic gas scavenging system is not allowed.

⚠ **WARNING**
Risk of overpressure
If the overpressure valve in the passive AGS or the scavenging hose is blocked, overpressure in the breathing circuit and in the patient's lungs will occur.
► Only connect the passive AGS to kink-proof and pressure-tight scavenging hoses.

⚠ **WARNING**
Risk of ambient air contamination
The ambient air will be contaminated if the passive AGS feeds excess anesthetic gas to a ventilation system with circulating air.
► Use the passive AGS only with ventilation systems that work without circulating air.

Connect the scavenging hose (1) to the nozzle on the AGS.



2. Secure the scavenging hose with the clip (2).
3. Lay the scavenging hose so that the gas is disposed of, e.g., by a ventilation system.
4. Fasten the end of the hose.

4.7 Preparation for an operation day / after cleaning and sterilization

► Assemble the device and prepare it ready for operation.
Observe the information in the following chapter: "Fitting and assembly", page 249.

4.8 Selecting and connecting patient-specific accessories

4.8.1 Fitting the breathing circuit and the filters

i This device is made without natural rubber latex.
To minimize the risk of contact with latex, use breathing bags and breathing hoses that are not made with natural rubber latex.

The device can be used with Infinity ID breathing hoses or conventional breathing hoses. If no leakage test has yet been performed after switching on the device, hose compliance and hose resistance will automatically be adopted when Infinity ID breathing hoses are connected.

i Do not use any inspiratory or expiratory bacteria filters if the ID functionality of the Infinity ID breathing circuit is to be used. In this case, fit a filter to the Y-piece. In cases which preclude use of a bacteria filter at the Y-piece, the Infinity ID function of the Infinity ID breathing circuit cannot be used.

1. Select suitable accessories for the respective patient category.

ℹ When applying tidal volumes in the transition range for a specific patient category, use the smaller breathing bag and the smaller breathing circuit.

	Adults		Pediatric patients	Neonates
Tidal volume	>700 mL	301 to 700 mL	50 to 300 mL	<50 mL
Breathing bag	3 L	2 L	1 L	0.5 L
Breathing circuit	Adults		Pediatric	Neonates (or pediatric)
Filter	Filter or HMEF			Use a filter with low resistance and compliance.

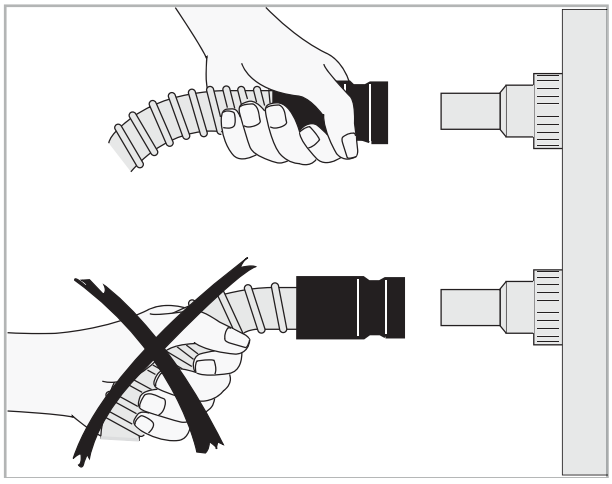
2. ⚠ **WARNING**
Risk due to particles and dust
In order to protect the patient from particles and dust, a filter must be used between the inspiratory limb of the breathing system and the patient.
► Use a filter at the Y-piece or at the inspiratory port.

⚠ **WARNING**
Risk of infection
The breathing system may be contaminated with infectious agents. The following causes may be present:
– No bacteria filters have been used at the Y-piece or at the expiratory port.
– The breathing system is being used for the first time.

Perform the following measures:
► Reprocess the breathing system before the first use.
► Reprocess the breathing system if necessary.
► To prevent future contamination, use bacteria filters close to the patient.

⚠ **CAUTION**
Risk due to too low tidal volumes
The hose configuration can influence the values for leakage, compliance, resistance, and the therapy. Consequently, the tidal volume, for example, may be too high or too low.
► Perform a leakage test after replacing breathing hoses, particularly extendable hoses.
► Do not use extendable hoses to ventilate neonates.

Assemble the breathing circuit and connect it to the Y-piece and nozzles on the breathing system. Observe the following information: "Permissible hose configurations", page 69.

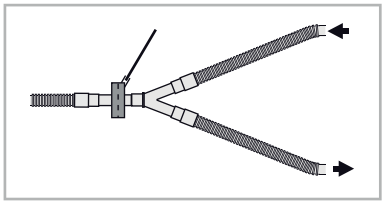
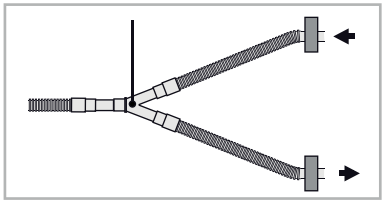
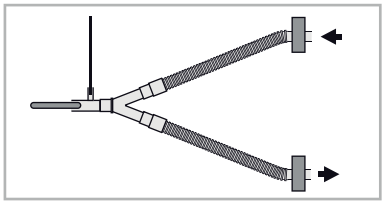
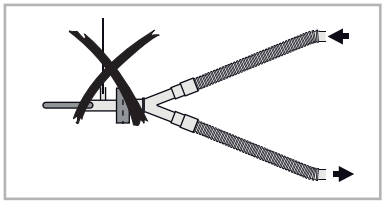
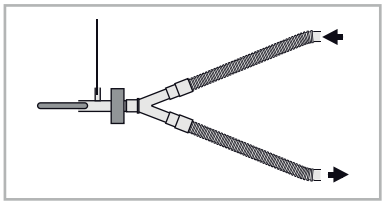


When attaching or removing the breathing hoses, always hold them by the connection sleeve and not by the hose itself.

4.8.1.1 Permissible hose configurations

Breathing hoses, sample line, and filters, etc., must be arranged carefully and adapted to the patient, particularly for neonates and pediatric patients. For further information see: "Improving the CO_2 measurement by means of an HME filter", page 308.

The permissible hose configurations are marked with an "X" in the following table:

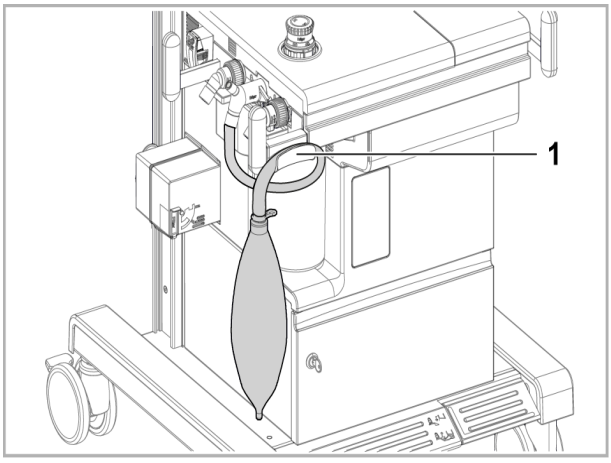
Configuration		Adult	Ped.	Neo.
	A breathing system filter or an HME filter between Y-piece and patient; sample line connected to the filter	X	X	
	One breathing system filter on each of the inspiratory port and expiratory port; sample line connected to the Y-piece	X	X	
	– One breathing system filter on each of the inspiratory port and expiratory port; sample line connected to a connector as close as possible to the patient – Extract the sample gas at a connector in which the gas has laminar flow without turbulence. – If no filter can be used at the expiratory port (e.g., if there is intrinsic PEEP due to Air trapping), reprocess the breathing system after every patient.	X	X	X
	When using fine pored filters between the Y-piece and the patient, do not connect the sample line between the tube and the filter but rather to the filter or Y-piece.		X	X
	When using a heat and moisture exchanger (HME) between the Y-piece and the patient, connect the sample line to a connector as close as possible to the patient. – Set the alarm limits for ***MV low*** and ***Paw high*** to suitable values. Observe the following information: "Reasonable alarm settings", page 309. – Only use HME filters that are listed in the list of accessories.		X	X

4.8.2 Breathing bag

The breathing bag can be mounted either on the breathing bag arm or, using the bag elbow and a breathing hose, mounted directly on the breathing system.

4.8.2.1 Attaching the breathing bag

1. Connect the breathing bag to the breathing bag hose using the connection nozzle. Attach the breathing bag hose to the bag elbow.



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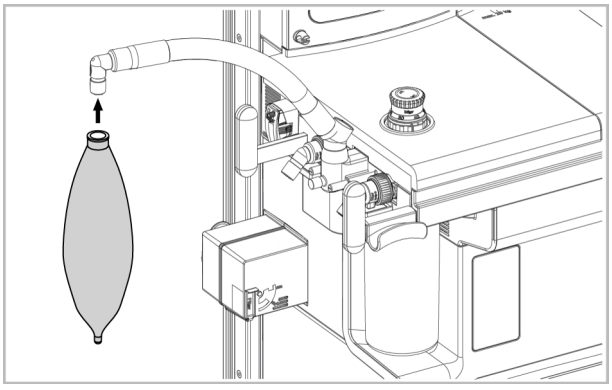
2. ⚠ **WARNING**
   Risk due to pinched breathing bag
   If the breathing bag is pinched, excessive airway pressures or a lack of fresh gas may result.
   ► When attaching, ensure the following:
   – The breathing bag is not pinched.
   – The breathing bag can inflate freely.

   Lay the breathing bag hose in the holder (1) in a loop so that the bag hangs on the left of the holder.
   Make sure that the breathing bag is not impeded by breathing hoses or cables when inflating.

4.8.2.2 Attaching the breathing bag to the breathing bag arm (option)

► Attach the breathing bag to the elbow.



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4.8.3 Observing resistance and compliance

Accessories such as filters influence the dead space, compliance, and resistance of the breathing circuit.

In addition, changes in resistance and compliance arise over time as a result of moisture in the breathing gas or residues of secretions.

4.8.3.1 Calculating the resistance of the breathing system and connected accessories

The sum of the resistance values in the inspiratory limb must not be less than –6.0 hPa (cmH_2O). The sum of the resistances in the expiratory limb must not exceed 6.0 hPa (cmH_2O).

Only include resistance values in calculations that were taken under the same flow conditions:

Patient category	Flow
Adults	30 L/min
Pediatric patients	15 L/min
Neonates	2.5 L/min

The following formula is used to calculate the resistance (R):

$R_{Inspiration}$ =
$R_{Breathing\ system\_insp} - R_{Insp\ hose} - R_{Breathing\ bag\ hose} - R_{Insp\ filter\ (port)} - R_{Insp\ filter\ (Y\text{-}piece)}$

$R_{Expiration}$ =
$R_{Breathing\ system\_exp} + R_{Exp\ hose} + R_{Exp\ filter\ (port)} + R_{Exp\ filter\ (Y\text{-}piece)}$

If necessary, take into consideration other parts such as water traps or additional hoses. The specifications for the resistance of the breathing system can be found on page 290. The specifications for all other accessories can be found in the respective instructions for use.

In these instructions for use, the specifications for the resistance in the inspiratory limb are regarded as negative values. The resistance values given in the instructions for use for the accessories must therefore be subtracted from the inspiratory resistance of the breathing system.

Example of calculation: Adult breathing hose with filter on Y-piece, no filters on the ports

	Inspiratory resistance [hPa (cmH_2O)] at 30 L/min		Expiratory resistance [hPa (cmH_2O)] at 30 L/min	
Breathing system with reusable CO_2 absorber and MX50115 soda lime dust filter	$R_{Breathing\_system\_insp}$	–1.2	$R_{Breathing\_system\_exp}$	2.9
Breathing hose	- R_{Insp_hose}	0.5	+ R_{Exp_hose}	0.5
Breathing bag hose	- $R_{Breathing\_bag\_hose}$	0.3		
Filter at inspiratory port	- $R_{Insp\_filter(port)}$	0		
Filter at expiratory port			+ $R_{Exp\_filter(port)}$	0
Filter at Y-piece	- $R_{Insp\_filter(Y\text{-}piece)}$	2	+ $R_{Exp\_filter(Y\text{-}piece)}$	2
Result	**$R_{Inspiration}$**	**-4.0**	**$R_{Expiration}$**	**5.4**

Since $R_{Inspiration}$ is greater than –6 hPa (cmH_2O) and $R_{Expiration}$ is less than 6 hPa (cmH_2O), this configuration may be used.

Depending on the breathing circuit in use, the connected accessories, and the resistance of the patient's airways, air trapping (incomplete expiration) may occur with some ventilation settings. Air trapping can be recognized on the flow waveform by the fact that the inspiration begins before the expiration has ended.

The effects are, for example, a reduced minute volume in pressure-controlled ventilation or higher mean airway pressures and peak pressures in volume-controlled ventilation.

Air trapping can be prevented on the anesthesia machine by the following measures:

– Adjusting the respiratory rate and inspiratory time
– Changing the configuration of breathing hoses and accessories that carry gases during the expiratory time

It is the responsibility of the user of the medical device to select the most suitable remedial measure.

4.8.4 Connecting a non-rebreathing system

Non-rebreathing systems are suitable and intended only for manual ventilation or spontaneous breathing. This connection is only possible with the "External fresh-gas outlet" option.

Since no rebreathing via the breathing system takes place when a non-rebreathing system is in use, the fresh-gas flow must be set at least as high as the minute volume.

Follow the instructions for use for the non-rebreathing system and the transfer hose.

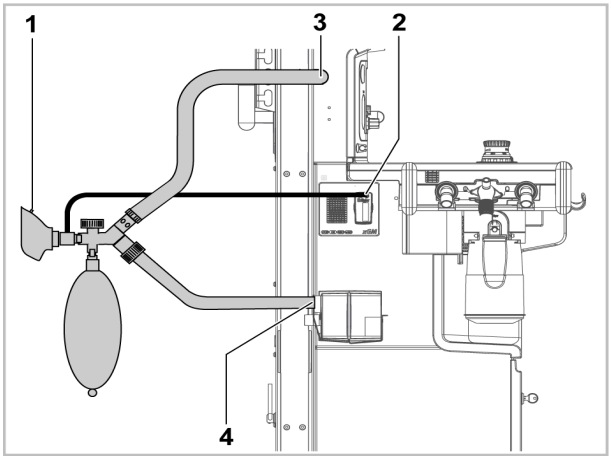
To prevent contamination of the ambient air with anesthetic gases, connect the gas outlet of the non-rebreathing system to the inlet on the AGS.

1. **⚠ WARNING**
   Risk of excessively high airway pressure
   Without a pressure release valve or breathing bag, airway pressure may become too high.
   ► Only non-rebreathing systems with breathing bags or pressure release valves which comply with ISO 8835-2 may be connected.

   Select a suitable non-rebreathing system.

2. **⚠ WARNING**
   Risk of faulty gas delivery
   Faulty gas delivery and insufficient gas supply when a non-rebreathing system is used may put the patient at risk. Thus O_2, CO_2, and any anesthetic gases must also be monitored for non-rebreathing systems.
   ► The sample line must be connected to the mask and the water trap on the anesthesia machine.
   ► Provide for suitable gas monitoring conforming to ISO 80601-2-55.
   ► Provide suitable O_2 monitoring for devices with inspiratory O_2 measurement.

   Screw the sample line securely to the mask (1) on the non-rebreathing system and to the water trap (2).



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   For masks without a connector for the sample line, optionally proceed as follows:
   ► Place the T-piece with a T-piece filter directly on the elbow. Screw the sample line firmly onto the T-piece filter. The part numbers for the T-piece and the T-piece filter are listed in the list of accessories.
   ► If necessary, connect the sample line to a filter on the Y-piece.
   Ensure the correct course of the sample line. Do not use adapters.
3. Connect the fresh-gas hose of the non-rebreathing system to the external fresh-gas outlet (3).
4. Remove the sealing plug from the inlet nozzle (4) on the AGS.
5. Use the transfer hose to connect the non-rebreathing system to the inlet nozzle on the AGS (4).

After using the non-rebreathing system

1. Dismantle the non-rebreathing system and the sample line.

2. ⚠ **CAUTION**
   Risk due to leakage from an open AGS inlet nozzle
   ► To prevent contamination of the ambient air with anesthetic gases, press the sealing plug back into the inlet nozzle after using a non-rebreathing system.

   Seal the inlet nozzle (4) on the AGS again with a sealing plug.

4.9 Connecting and replacing consumables

4.9.1 Disposable CO_2 absorber

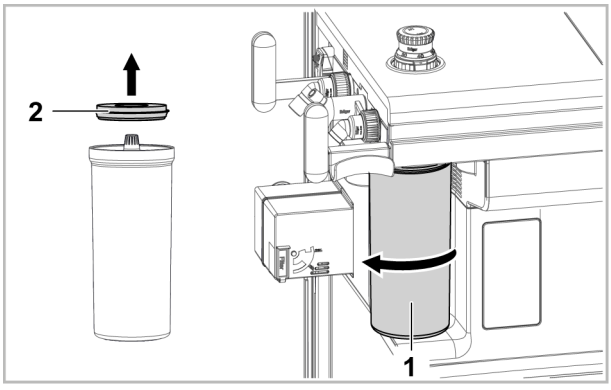
► Connect or replace the CLIC absorber in accordance with its instructions for use.

4.9.2 Reusable CO_2 absorber

As an alternative to disposable CO_2 absorbers, a reusable CO_2 absorber may also be used.

4.9.2.1 Dismounting and emptying

1. Unscrew the CO_2 absorber (1) from the breathing system.



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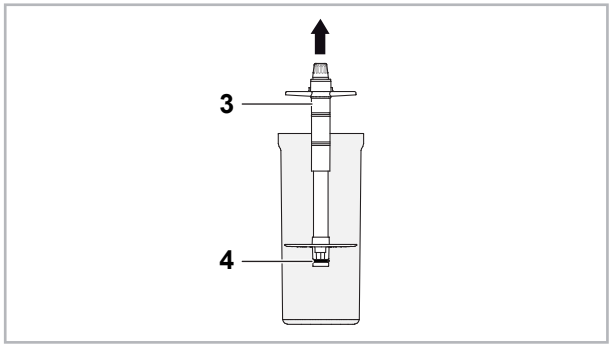
2. Remove and dispose of the disposable dust filter (2), if present.

3. ⚠ **CAUTION**
   Risk of chemical burns
   Soda lime is caustic and is a strong irritant for eyes, skin, and airway.
   ► Handle the soda lime carefully and do not spill it.

   Empty out the used soda lime and dispose of it according to its instructions for use.

4. Remove the absorber insert (3) from the absorber container. The sealing ring (4) remains on the absorber insert.



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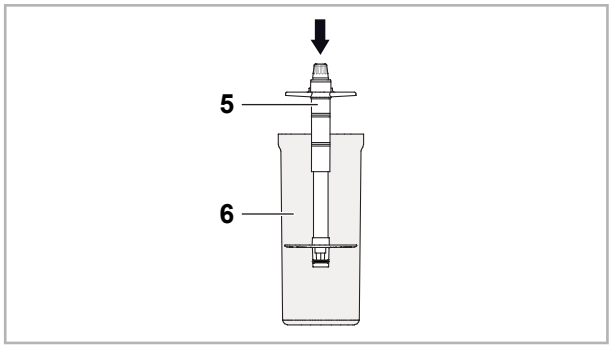
Further reprocessing of the individual components is performed in accordance with the chapter "Machine reprocessing" on page 242.

4.9.2.2 Filling and mounting

1. Push the absorber insert (5) into the absorber container (6).



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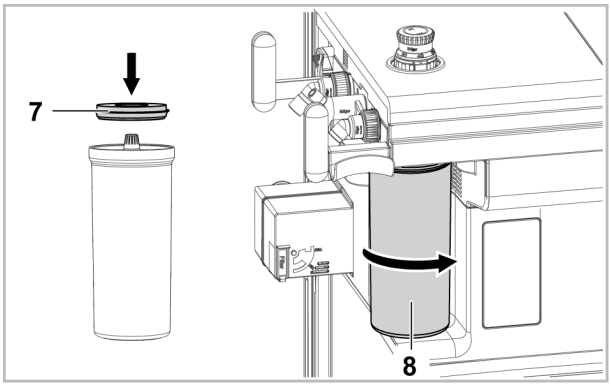
2. **⚠ CAUTION**
   Risk of chemical burns
   Soda lime is caustic and is a strong irritant for eyes, skin, and airway.
   ► Handle the soda lime carefully and do not spill it.

   Fill the CO_2 absorber with fresh soda lime to the upper mark.
   Recommendation: Use Drägersorb 800 Plus or Drägersorb Free.

3. **⚠ WARNING**
   Risk of hypoventilation and incorrect gas measurement
   Reuse of the disposable dust filter can increase the filter resistance and impair the ventilation function of the device.
   ► If soda lime from third-party manufacturers is used, e.g., granular soda lime, use a disposable dust filter and replace it with every change of the soda lime.

   If soda lime from third-party manufacturers is used, insert a new disposable dust filter (7). Only use dust filters from the list of accessories.

Only use undamaged filters.



4. Attach the CO_2 absorber (8) to the breathing system from below. Rotate it in the direction of the arrow until it reaches the stop.

Follow the instructions for use for the particular soda lime.

4.9.3 Water trap

► Empty or replace the water trap according to its instructions for use.

4.9.4 Connecting the sample line

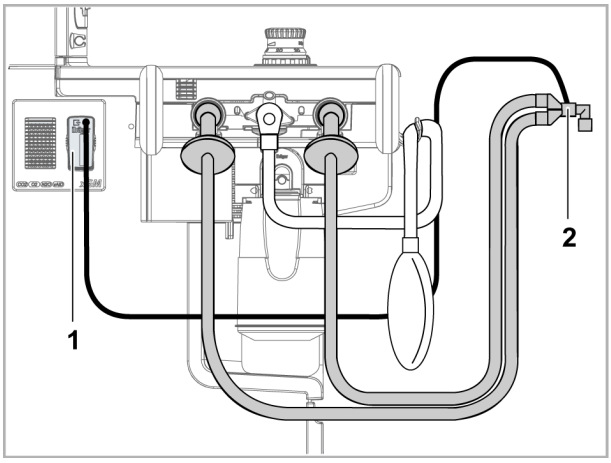
► **⚠ WARNING**
Risk due to occluded components in the breathing circuit
In the following cases, the sample gas flow can immediately cause negative pressure in the lungs:
– Filters, hoses, or endotracheal tubes are blocked.
– The sample gas is being extracted between the patient and an occluded component.
Ensure the following when ventilating pediatric patients and neonates:
► When fine pored filters are used, do not connect the sample line between the tube and the filter.
► If the sample line is connected close to the patient, set the alarm limits for ***MV low*** and ***Paw high*** to suitable values. Observe the following information: "Improving the CO_2 measurement by means of an HME filter", page 308.

⚠ WARNING
Risk due to incorrectly connected sample line
If the sample line is connected to the wrong connectors, e.g., connectors on infusion pumps, fluids may be drawn in instead of sample gas. Consequently, the gas measurement may not display correct values.
► When connecting the sample line, take care that it is correctly connected.

⚠ WARNING
Risk of incorrect measured gas values
Blocked water traps or blocked sample lines prevent correct gas measurement. As a result, incorrect measured gas values could be displayed.
► Only use Dräger sample lines.

Screw the sample line on to the water trap (1) and to the Y-piece, HME filter or hose adapter (2).
Ensure the following:

– Ensure the correct course of the sample line.
– Do not use adapters.
– Particularly when ventilating pediatric patients and neonates, a sample line connection close to the patient can improve the quality of the measured CO_2 values. Observe the following information: "Improving the CO_2 measurement by means of an HME filter", page 308.
– When tube adapters are used for the sample line connection, make sure the volume (dead space) is small.



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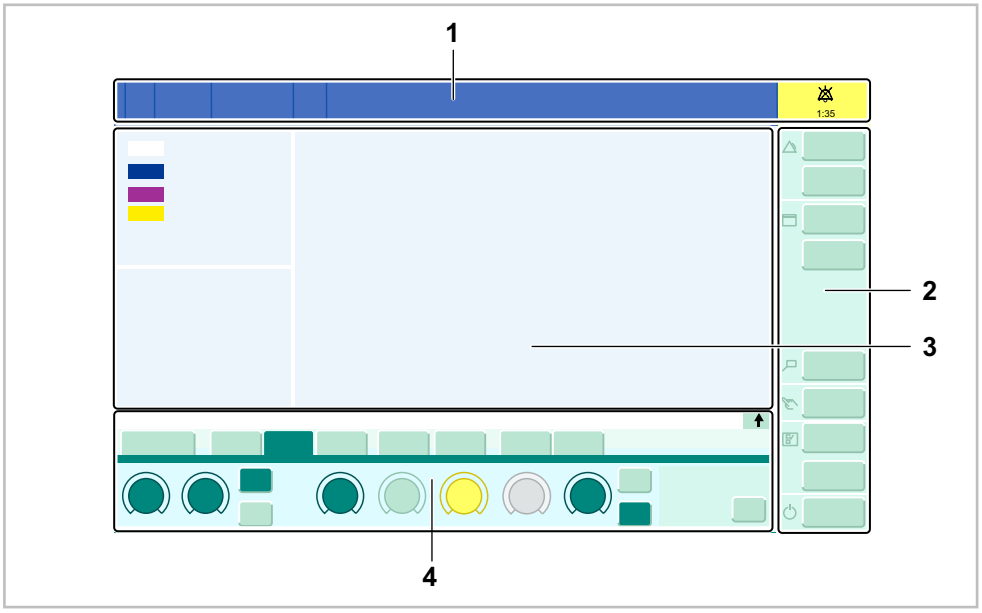
5 Operating concept

5.1 Screen

5.1.1 Main screen

The main screen displays the most important information regarding anesthesia and ventilation.

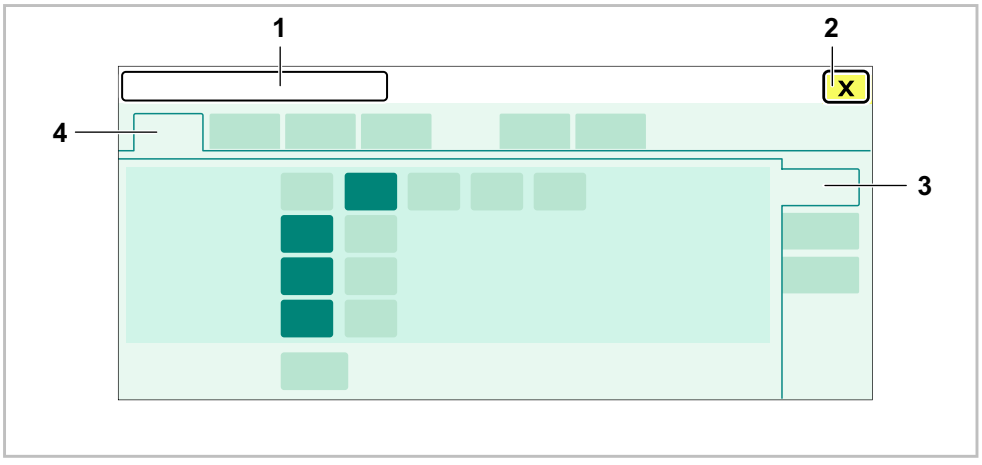


No.	Designation	
1	Header bar	The header bar shows the following information: – Patient category – Patient data – System information (date, time, device name) – Alarms, messages, and notifications – Information regarding temporarily deactivated alarms
2	Main menu bar	The main menu bar contains buttons to open dialogs and activate functions. These buttons are assigned to various groups. For further information, see the following chapter: "Overview of the menu structure", page 323

No.	Designation	
3	Monitoring area	The following information is displayed in the monitoring area: – Gas measurement – Waveforms – Parameter fields – Loops (Pressure-Volume and Flow-Volume) – Mini-trends – Virtual flow tubes For further information see: "Customizing the current view", page 109.
4	Therapy bar	The ventilation settings can be adjusted in the therapy bar. Electronically controlled gas mixer: – Ventilation modes – Ventilation parameters – Fresh-gas delivery Mechanically controlled gas mixer: – Ventilation modes – Ventilation parameters

5.1.2 Dialogs

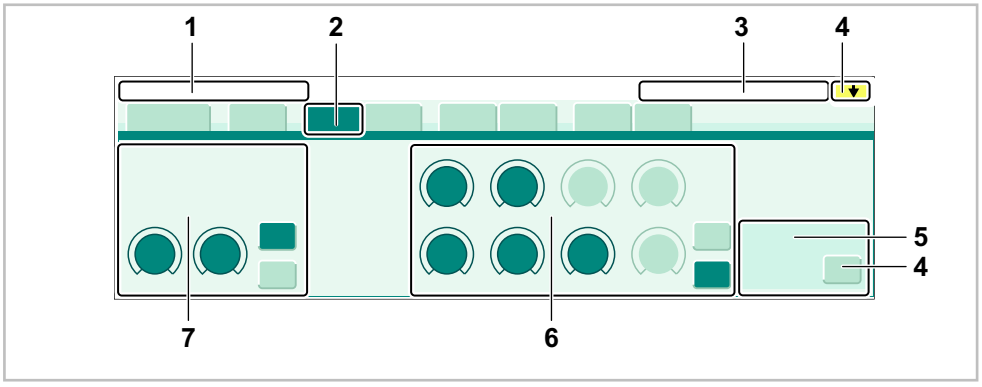
Dialogs consist of one or more pages which are displayed by touching the corresponding horizontal or vertical tab.



No.	Designation
1	Title of the dialog
2	Button for closing the dialog
3	Vertical tab to open subordinate structures
4	Horizontal tab to open a page

5.1.3 Therapy bar

The following illustration shows the expanded therapy bar for the electronically controlled gas mixer:



No.	Designation
1	Name of active ventilation mode
2	Tabs
3	Notification field
4	Buttons to expand and collapse the therapy bar
5	Field with additional information: – More values – Spontaneous breathing activity of the patient
6	Therapy controls for ventilation parameters and buttons for synchronizing the breaths
7	With electronically controlled gas mixer: Therapy controls and buttons for fresh-gas delivery

Start values

Arrows ▼ on the scales of the therapy controls mark the start values resulting from the patient data and start settings. The start values can be configured, see page 166.

Linked therapy controls

Certain parameters can be linked to other parameters. If one parameter is changed, the linked parameter is also selected and changed. Among other things, this applies to the adjustment of ventilation pressures, ventilation times or during electronically controlled fresh-gas delivery.

Example: The device can be configured so that a change to the ***PEEP*** setting automatically causes a change to ***Pinsp***; as a result, the difference between ***PEEP*** and ***Pinsp*** and therefore the tidal volume remain constant.

Linking therapy controls, see page 175.

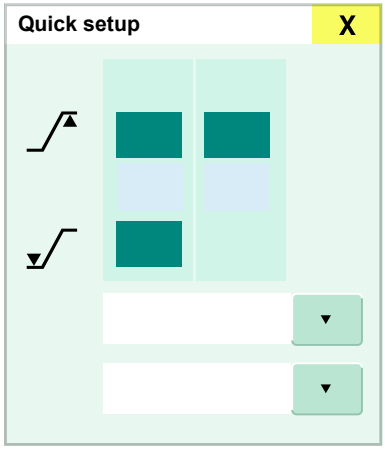
Setting ranges

Some settable parameters may be limited or be mutually restricted so that certain combinations of therapy settings are not possible, e.g., ***Ti*** 6.9 s at ***RR*** 100 /min.

If a state is reached in which a parameter cannot be changed any more, the device displays a corresponding message in the notification field (3).

5.1.4 Quick setup dialog

Depending on the parameter field or waveform, this dialog contains various setting possibilities, e.g., for limits or scales.



34767

This dialog can be opened by touching the corresponding parameter field in the monitoring area. This dialog can be configured so that it opens automatically in the event of an alarm, see page 170.

5.2 Color concept

5.2.1 Colors of the control elements

Colors denote the availability of functions and settings.

5.2.1.1 Therapy controls and buttons

Color	Example	Meaning
Dark green		Available element: function activated
Yellow		Selected element: not yet confirmed with rotary knob
Light green		Available element: function not activated
Dark gray		Control element: currently not available, function activated
Gray		Unavailable element

5.2.1.2 Rotary knob

The rotary knob lights with different colors.

Color	Meaning
Blue	Therapy in progress.
Yellow	A function or setting must be confirmed.
Flashing yellow	A function or setting, which is still not confirmed, will be reset within the next 5 seconds.

5.2.2 Waveforms and parameters

Waveforms for mandatory breaths are displayed in the colors specified in the system configuration, see page 167.

In the flow waveform, spontaneous breathing and pressure support are displayed in a light brown color.

Measured values whose specified accuracy cannot be maintained are displayed in gray.

5.2.3 Color codes for anesthetic agents and medical gases

Standardized color codes complying with ISO 5359 / ISO 32 / ISO 5360 are used to identify anesthetic agents and medical gases.

The colors for O_2, Air, and N_2O conform to locally applicable standards.

5.2.4 Daytime colors and nighttime colors

There are 3 color schemes that can be selected:

– ***Day light***
– ***Day dark***
– ***Night***

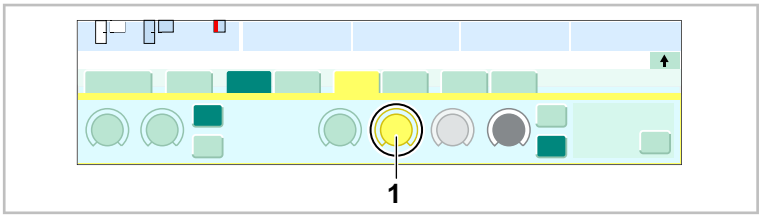
Setting the color schemes, see page 112.

5.3 Selecting and setting

5.3.1 Setting of parameters

Changes to these settings always require confirmation by pressing the rotary knob.

1. **Select**
   Touch the control element (1). The color turns yellow. For therapy controls, the unit of the parameter to be set is displayed.



34777

2. **Set**
   Turn the rotary knob. For some therapy controls, faster turning raises the increment value.
3. **Confirm**
   Press the rotary knob. The color of the control element changes to green.

In the subsequent chapters of this document, these steps will be written in simplified form as follows:

– "Set the value."
– "Touch the button."

5.3.2 Canceling the setting procedure or the change procedure

If a change to a parameter should be canceled (color is still yellow), the following options exist to retain the previous setting:

► Touch the changed parameter again. This resets the selection of and the change to the parameter.

► Select another parameter. This selection resets the change made to the previous parameter.
► Do not press the rotary knob. After 15 seconds, the change is reset and signal tones sound during the last 5 seconds (timeout).

5.3.3 Activation of buttons

Some buttons are immediately active without additional confirmation. The color immediately turns to dark green.

Examples:
– Selecting a view
– Deactivating the CO_2 alarms

5.3.4 Operating the flow control valves

The flow control valves of the mechanically controlled gas mixer and the O_2 flowmeter are operated as follows:

Opening the flow control valve

► Turn the flow control valve counterclockwise.

Closing the flow control valve

► Turn the flow control valve clockwise to the end stop.

In the subsequent chapters of this document, the following is represented by simplified explanations:
– "Open the flow control valve."
– "Close the flow control valve."

6 Getting started

6.1 Safety instructions

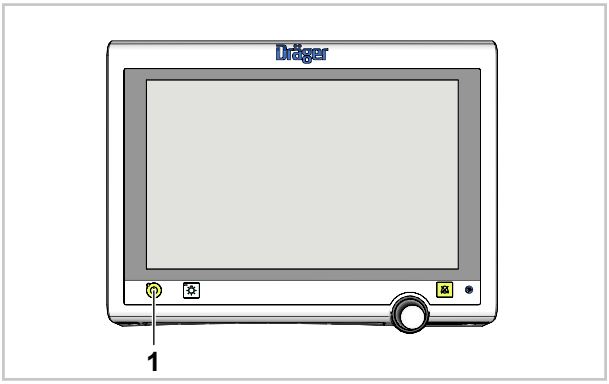
Checking the safety systems

Some safety systems are only checked during start-up. If this check is not performed regularly, a device malfunction may occur, putting the patient at risk.

► Restart the device at least once per month so that the safety systems will be checked regularly.

6.2 Turning on the device

Prerequisite: The device has been reprocessed (see page 222) and assembled ready for operation (see page 45).



35026

1. Connect the device to the mains power supply.
2. Set the main switch to position ***I***.
3. ⚠ **CAUTION**
   Risk of device malfunction
   Condensed water may form when the device is brought from a cold storage location into a warm environment.
   ► To prevent condensation and resulting failures of electrical components, do not turn on the device after abrupt temperature changes for 1 to 2 hours.

   Press the ⏻ key (1).

The device starts. The ***Standby*** page is displayed.

If there is sufficient battery charge, the device will also start without the power plug being plugged in.

6.3 Checking the device configuration

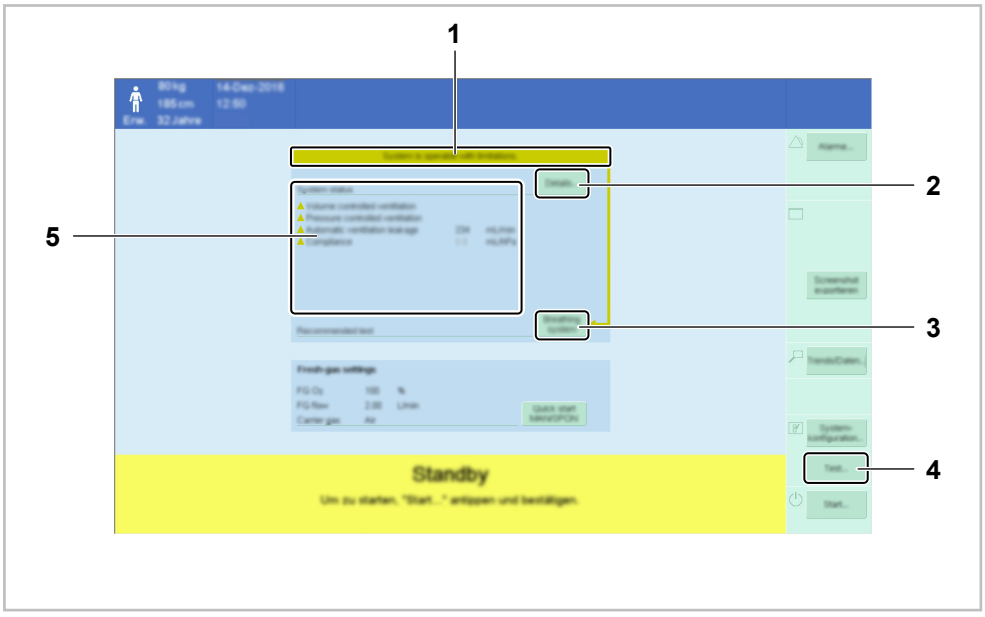
The device can be customized to suit the requirements of the user. Settings for the following features are possible:

– Start settings for the ventilation
– Alarm limits
– General device behavior

For further information about the configuration, see page 166.

6.4 Checking the operational readiness

Using colors, the ***Standby*** page (1) indicates whether the system test was successful and the device is ready for operation.



Color	Meaning
Green	***System is fully operational.***
Yellow	***System is operational with limitations.*** There are functional restrictions. Take further measures to ensure patient safety (e.g., external monitoring).
Red	***System is not operational.*** Contact service personnel if necessary.

If the device is not fully operational, the most important irregularities (5) are displayed along with a recommendation to perform a specific test (3).

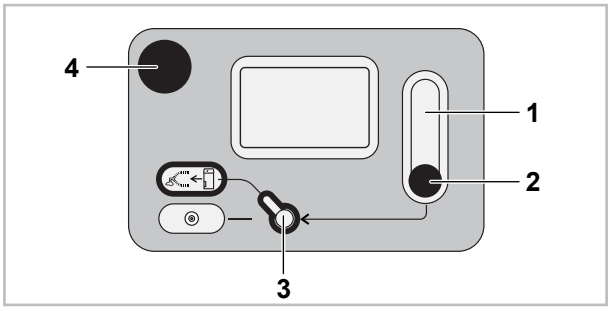
Additionally, the current system leakage is displayed in area (5).

To view details regarding the status of the device, touch the ***Details...*** button (2) or the ***Tests...*** button (4), see page 126.

Dräger recommends performing the system test every 24 hours. Otherwise, it will not be possible to ensure that the device is functional.

6.5 Emergency start-up

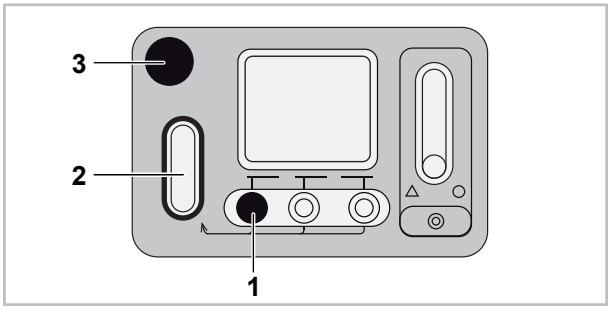
6.5.1 Electronically controlled gas mixer



35041

1. Adjust the APL valve.
2. Set the O2 switch (3) to the ***Add. O2*** position.
3. Open the flow control valve (2) and set the desired O2 flow. If necessary, press the ***O2+*** key (4) to quickly fill the breathing bag.
4. Monitor the set flow on the O2 flowmeter (1).
5. Set the anesthetic gas concentration on the vaporizer.
6. Ventilate the patient manually.
7. Turn on the device.
8. As soon as the ***Standby*** page is displayed, start the therapy, see page 93.
9. Set the O2 switch (3) to ***Aux. O2***.
10. Close the flow control valve (2).

6.5.2 Mechanically controlled gas mixer



35054

1. Adjust the APL valve.
2. Open the flow control valve (1) and set the desired O2 flow. If necessary, press the ***O2+*** key (3) to quickly fill the breathing bag.
3. Monitor the flow on the total flow tube (2).
4. Set the anesthetic gas concentration on the vaporizer.
5. Ventilate the patient manually.
6. Turn on the device.
7. As soon as the ***Standby*** page is displayed, start the therapy, see page 93.

7 Operation

7.1 Safety instructions

7.1.1 Alarms

Alarm volume

If the alarm volume is too low, alarm signals may not be heard. The patient may be put at risk.

► Set the alarm volume loud enough so that the alarm signals can be heard in the environment where the device is located.

► The user must remain within earshot of the alarm signals.

Recognizing alarm signals

If alarm signals are not noticed, the patient may be put at risk.

► Dräger recommends that the user remains in the vicinity of the anesthesia machine, i.e. within a distance of up to 4 meters (12 feet). This facilitates fast recognition and response in the event of an alarm.

► If the causes of the alarm are only temporary, the alarms will likewise only be indicated temporarily.

Impaired Infinity ID functions

Electromagnetic disturbances or faults in Infinity ID components can cause permanent alarms.

► Contact service personnel to deactivate the Infinity ID alarms.

7.1.2 Therapy and applications

Therapy with known pre-existing conditions

Volatile anesthetic agent may trigger malignant hyperthermia. As a result, the patient could be put at risk.

► For patients suspected of malignant hyperthermia: Do not use any volatile anesthetic agent or devices with residual concentrations of these gases above 5 ppm.

For further information and recommendations for therapy settings for patients with suspected malignant hyperthermia, contact the responsible national Dräger organization.

Under certain conditions, acetone can accumulate in the patient’s body during anesthesia. As a result, the patient could be put at risk.

► Do not perform low-flow anesthesia on patients with ketoacidosis or patients under the influence of alcohol.

Unintentional start of therapy

If the device is in the standby mode and the flow control valves on the mechanically controlled gas mixer are opened, the device will exit the standby mode and start the Man / Spon mode.

► Take care that this does not happen unintentionally.

Device malfunction during operation

Device malfunctions can compromise the correct therapy functionality of the device. As a result, the patient could be put at risk.

► Only operate the device under the constant supervision of users.

► Always keep a manual resuscitator ready.

Displays and therapy decisions

The status display serves as the primary information source for the internal airway pressure and for the flow (only with a mechanically controlled gas mixer).

► In the following cases, use the pressure gauge display and the total flow tube (only with a mechanically controlled gas mixer) as the information source for therapy:
  – The status display has failed.
  – The values on the status display do not match the values on the total flow tube.

The following situations could result in misdiagnoses, which could put the patient at risk:

– Measured values are misinterpreted.
– Measured values are incorrectly or inaccurately displayed.
– The accuracy of the measurements of flow and volume may be impaired if the breathing system warmer is switched off.
– The parameter under consideration is not meaningful (e.g., MV×CO_2, O_2 uptake, anesthetic agent uptake)

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

► Only use the trend curve for the MV×CO_2 and O_2 uptake parameters as a basis for therapeutic decisions.

► Therapeutic decisions must be made solely by the user. For further information see: "User group requirements", page 11.

► Do not use the virtual flow tubes of the electronically controlled gas mixer alone when making therapeutic decisions.

Measured gas values and waveforms such as the CO_2 waveform are determined on the basis of the composition of the sample gas. The composition of the sample gas is affected by many factors and their interactions, especially in patients with low body weight. This may result in biased measured values or waveforms and thus to misinterpretations. As a result, the patient could be put at risk.

The following factors affect the sample gas measurement:

– Dead space
– Airway resistance of the patient
– Compliance of the patient
– Type of surgical procedure
– Gas sampling site
– Breathing circuit, filter, sample line, tube
– Ventilation settings and the resulting ventilation
– Leakage
– Spontaneous breathing
– Cardiogenic oscillations
– I:E ratio and the respiratory rate

► Adhere to the following:
  – Do not make therapeutic decisions based solely on individual measured values or parameters.
  – If possible, minimize the effects of the factors described above, e.g., take the sample gas from a gas sampling site close to the patient, minimize leakage, adjust the ventilation settings.
  – The measured values are not meaningful during the warm-up time of the patient-gas measurement module.

Data (e.g., measured values, alarms) which the anesthesia machine transfers to other systems such as patient monitors or EMR systems may be displayed there incompletely or incorrectly and may thus put the patient at risk. Consequently, the data are intended to be used only for information purposes.

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

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

7.1.3 Risk of infection

The circuit plug is color marked. This marking indicates that the circuit plug could transmit pathogens between patients. If a used Y-piece or filter is fitted to the circuit plug, and then later a reprocessed component is fitted (e.g., during a leakage test), the new component can become contaminated.

► Only fit reprocessed components to the circuit plug.

► Do not plug already used hoses with attached filters or Y-pieces onto the circuit plug but instead hang them over the handles on the left-hand side of the device.

7.1.4 Flammable gases

In combination with oxygen or nitrous oxide, ignition sources such as electrosurgery, laser surgery, and faulty cables or connectors can cause fires. As a result, user and patient could be put at risk.

- ► This device is not approved for use in areas where oxygen concentrations greater than 25 Vol%, combustible, or explosive gas mixtures are likely to occur.
- ► Maintain a distance of at least 200 mm (7.9 in) between electrical connections and components which conduct oxygen and nitrous oxide.
- ► Cables and connections must be sufficiently insulated and must not be damaged. Check cables for damage daily.
- ► Disconnect all oxygen feeds if oxygen leakage is suspected in the device or its vicinity. Do not operate the device, and contact service personnel.
- ► Keep ignition sources away from the device.

If a fire starts in the immediate vicinity of the patient, the device could also catch fire. Personal injury and property damage may occur as a consequence.

- ► Disconnect the oxygen-carrying connections from the device and the patient.
- ► Extinguish the fire and tend to the patient’s medical needs.

7.1.5 Working light

Looking directly into the LEDs of the working light may damage the retina. User and patient could be put at risk.

- ► Do not look directly into the LEDs.
- ► Make sure that the patient is not dazzled by the LEDs.

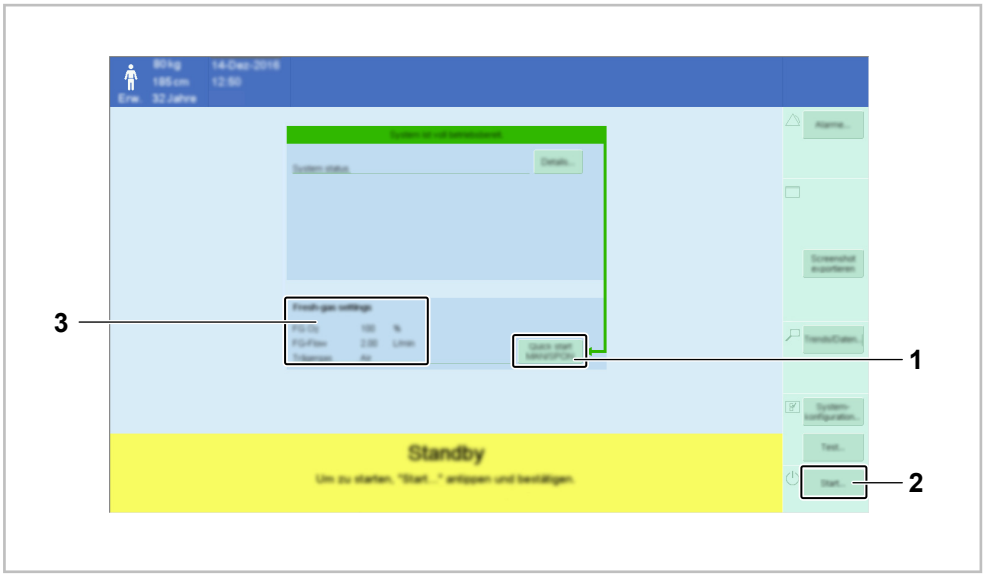
If illumination without neutral colors is used during the medical examination of the patient, this may result in, e.g., misinterpretation of skin coloring.

- ► Do not use the device's working light for examinations.
- ► For examinations, use an examination light conforming to IEC 60601-2-41.

7.2 Starting the therapy

The therapy can be started either from a quick start into the ***Manual / Spontaneous*** mode or from a normal start with customized settings.

Prerequisite: The device is in ***Standby*** mode.



Quick start

Electronically controlled gas mixer:
The fresh-gas settings (3) are displayed.

► Touch the ***Quick start Man/Spon*** button (1).

Mechanically controlled gas mixer:

► Open the flow control valves. The device switches automatically to the ***Manual / Spontaneous*** mode. Take care that the quick start does not happen unintentionally.

Or:

► Touch the ***Quick start Man/Spon*** button (1) and open the flow control valves.

Normal start with customized settings

1. Optionally perform one of the following steps:
   - ► Touch the ***Start...*** button (2).
   - ► Touch the screen in the monitoring area (4).
   - ► Squeeze the breathing bag.
2. Adjust the patient data and ventilation settings.

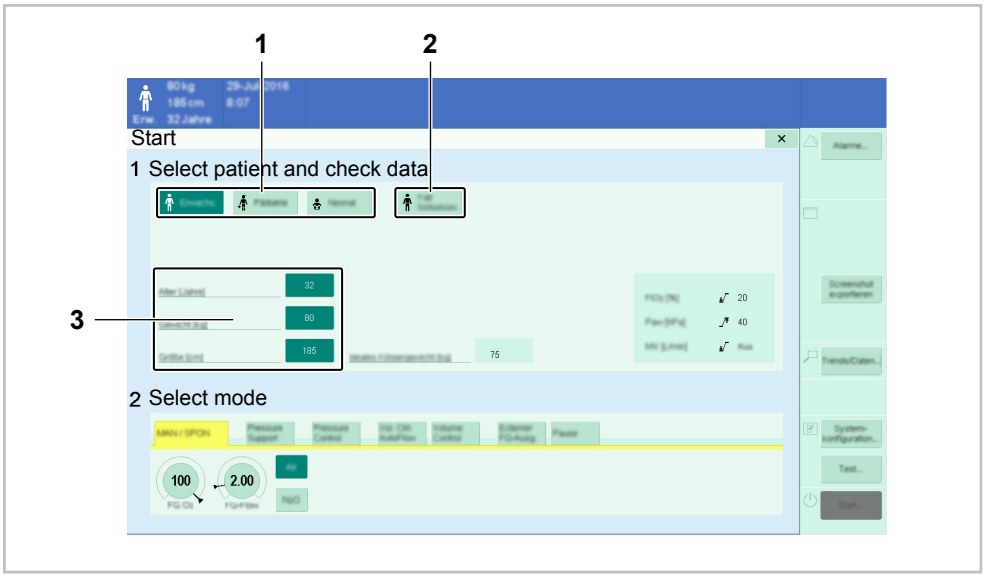
Starting when time is limited

When time is limited, it is possible to bypass the adjustment of the patient data and the ventilation settings. Start the therapy as follows:

1. Touch the screen.
2. Check the displayed start values.
3. Press the rotary knob. The therapy starts.

4. Adjust the patient data and ventilation settings as soon as possible.

7.2.1 Loading the patient data



There are two possibilities for loading the patient data:

– Starting a new case (1)
– Continuing a case (2)

Depending on the selected patient category, different patient data (e.g., weight, age) are displayed in area (3).

7.2.1.1 Starting a new case

► Touch the button for the desired patient category (1).

For new patients, the device uses defined start settings for ventilation settings and alarm limits, see page 166. The set value for ***Ti*** is automatically set based on ***RR*** in such a way that the resulting ***I:E*** ratio is 1:1 for neonates and 1:2 for all other patient categories.

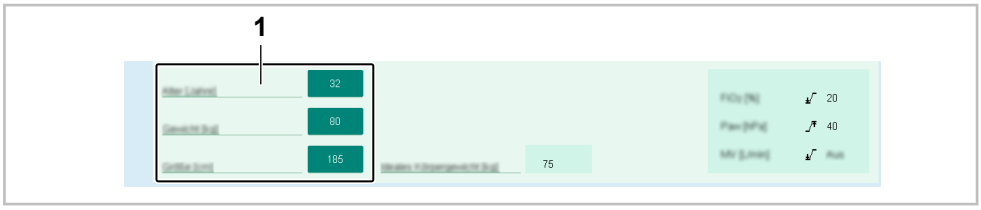
7.2.1.2 Continuing a case after an interruption

► Touch the ***Continue case*** button (2).

The device continues to use the ventilation settings and alarm limits that were set at the start of the case.

This function is only available if a case has previously been started and then interrupted.

7.2.2 Checking the patient data



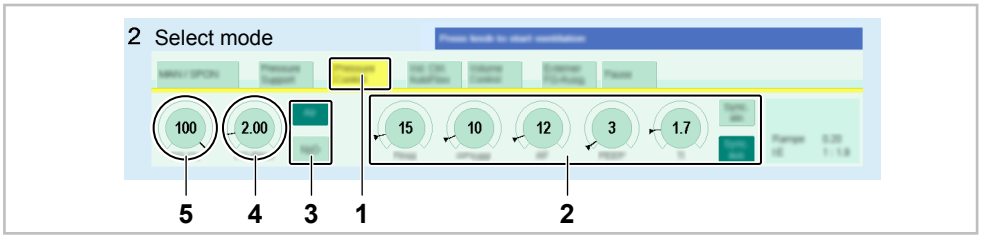
► **⚠ WARNING**
Risk due to incorrect settings
Different standard alarm limits or therapy settings might be configured for medical devices within the same area. The user must observe the following:
► Make sure that the set values and alarm limits are selected to suit the patient.
► Make sure that the alarm system is neither rendered useless by setting extreme values for the alarm limits nor deactivated by switching off the alarms.
► Check the therapy settings, the start settings for alarms, and the alarm settings during a change of ventilation mode.
► Only turn off alarms if the safety of the patient will not be compromised as a result.

⚠ CAUTION
Risk due to incorrect setting for patient age
Incorrectly setting the patient age can lead to incorrect xMAC values and thus to an incorrect anesthetic agent delivery.
► Always set the patient age correctly.

Adjust the patient data (1).

The device will suggest appropriate therapy settings for these data, e.g., for tidal volume, respiratory rate, and alarm limits. For more information, see page 311.

7.2.3 Setting and starting the therapy



1. Select the ventilation mode (1).
   The following ventilation modes are available:
   – ***Man / Spon***
   – ***VC***
   – ***PC***
   – ***VC - AF***
   – ***PSV***

The following operation modes are also available:

– ***Ext. FGO***

– ***Pause***

For further information see: "Description of the ventilation modes", page 298.

2. ⚠ **WARNING**
   Risk of patient injury
   The use of minimal-flow settings or low-flow settings can lead to the following problems:
   – Accumulation of metabolic by-products in the breathing system
   – Condensed water in hoses
   – Condensed water in the piston diaphragm
   ► Follow the recommendations of professional societies (e.g., regular flushing of the breathing system).
   ► Check for condensed water in the hoses and remove if necessary.
   ► Use water traps in the breathing hoses.

   Set the fresh-gas delivery.

   The device is equipped with a minimum O_2 delivery function which ensures that a minimum quantity of oxygen is delivered. For further information see: "Minimum O_2 delivery", page 310.

   Electronically controlled gas mixer:

   ► Select the carrier gas (3).
   Set the O_2 concentration (5) and fresh-gas flow (4).

   Mechanically controlled gas mixer:

   ► Open and set the flow control valves for the required gases.
   Also use the total flow tube to check the total flow set, see page 29.
3. Adjust the ventilation settings (2).
4. Press the rotary knob. The therapy starts and a signal tone sounds.

7.3 Adjusting the therapy

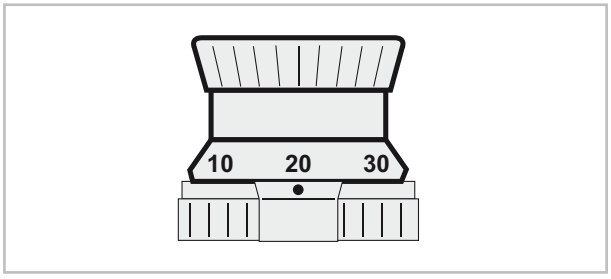
7.3.1 Setting the APL valve

The pressure limitation set with the APL valve only takes effect during manual ventilation or spontaneous breathing.

⚠ **WARNING**
Risk of excessively high airway pressures
If the ventilator fails, the device switches into the ***Man / Spon*** ventilation mode.
► Also set the APL valve to a value suitable for the patient when using mechanical ventilation modes. If the ventilator fails, ventilate the patient manually.

► The selection between manual ventilation (***Man***) and spontaneous breathing (***Spont***) is made at the APL valve, see page 18.

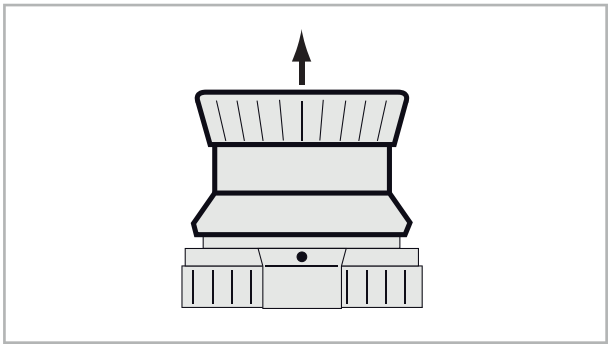
7.3.1.1 Manual ventilation



35256

► Set the APL valve to the desired maximum airway pressure.

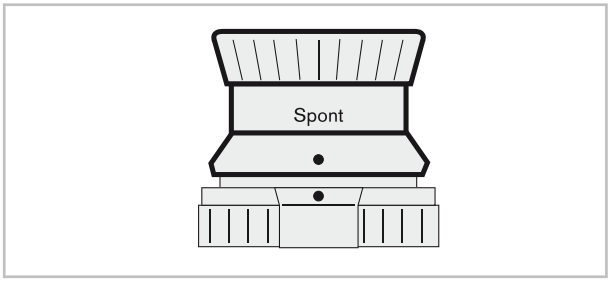
The patient can be ventilated with the breathing bag. The pressure is limited to the set value.


35264

In the ***Manual / Spontaneous*** mode, lifting the valve relieves pressure from the breathing system.

7.3.1.2 Spontaneous breathing

► Turn the APL valve counterclockwise as far as it will go.



35265

The dots are aligned vertically over one another. The valve lifts.

The pressure limitation is canceled and the valve is open for free spontaneous breathing.

7.3.2 Using the O_2 flush

The O_2 flush is used for flushing and quickly filling the breathing system and breathing bag with oxygen. The vaporizers are bypassed for this.

► Press the ***O_2+*** key.
O_2 continues to flow for as long as the key is pressed.

ℹ The gas concentration can change abruptly when the O_2 flush is used.

Using the O_2 flush has the following effects:

– In manual ventilation, pressing the O_2 flush results in a rapid rise in pressure to the APL level.
– In mechanical ventilation, permanently pressing the O_2 flush may result in a slight rise of the PEEP level. However, this rise has no effect on the peak pressure.

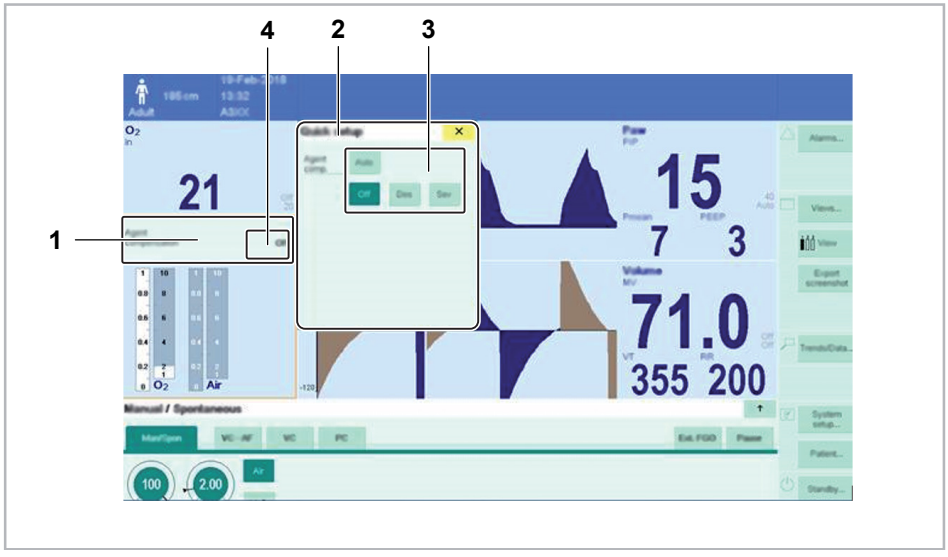
7.3.3 Using the vaporizer

► Operate the vaporizer according to its instructions for use.

7.3.4 Anesthetic gas compensation

The gas composition can affect the measurement accuracy of the flow measurement. If the device is equipped with inspiratory O_2 measurement, the accuracy of the flow measurement can be ensured by the anesthetic gas compensation.

1. Touch area (1); a further dialog (2) will open.



2. ⚠ **CAUTION**

Risk of inaccurate measured flow values

If the anesthetic gas compensation is incorrectly set, the resulting incorrect measured flow values can lead to incorrect measured values for the tidal volume.

► Make the settings for the anesthetic gas compensation carefully.

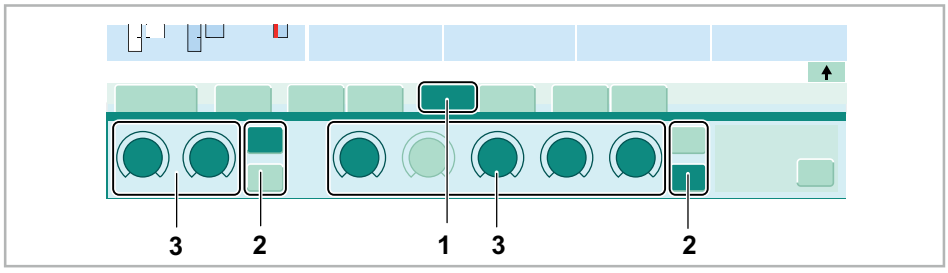
Choose one of the following selection options (3):

– ***Off***: The measured flow values will not be corrected.
– ***Des***: The measured flow values will be corrected for desflurane using an average value. For more information, see table page 175.
– ***Sev***: The measured flow values will be corrected for sevoflurane using an average value. For more information, see table page 175.

– ***Auto***: This setting is available when an anesthetic gas monitor is connected via the COM 2 serial port (e.g., Dräger Vamos). The flow measurements are automatically corrected for the anesthetic gas detected by the anesthetic gas monitor. If no anesthetic gas is detected or if the data connection to the anesthetic gas monitor is interrupted, no compensation takes place and the message ***None*** (4) is displayed.

7.3.5 Changing the ventilation mode

1. In the therapy bar, touch the tab (1) of the new ventilation mode.
   When the ventilation mode is changed, the ventilation settings are adopted from the previous ventilation mode or they are sensibly derived.
   In addition, the alarm settings are adjusted to reasonable values, see page 159.



35268

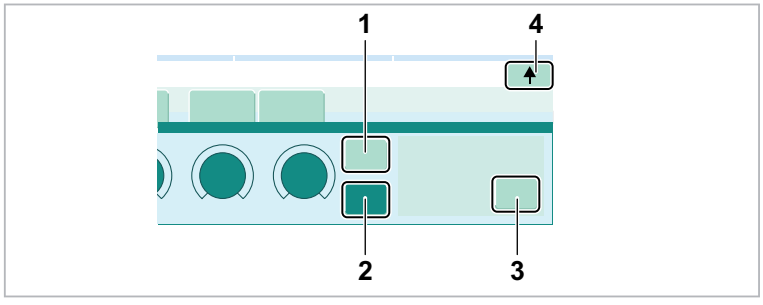
2. Adjust the therapy controls (3) or the buttons (2).
3. Activate the ventilation mode with the rotary knob. A signal tone is emitted when the mode is changed.

7.3.6 Synchronizing the breaths

Prerequisite: The device has the "Spontaneous breathing support" option.

Turning on the synchronization activates the set pressure support, for example, see page 298.

1. Turn the synchronization on or off with the buttons ***SIMV*** (1) or ***CMV*** (2).



35279

2. If required, show the extended therapy bar with one of the ***More*** buttons (3) or (4). Then adjust the additional parameters (***Trigger***, ***ΔPsupp***, etc.).

⚠ WARNING
Risk of insufficient ventilation
In ventilation modes in which breaths are to be triggered only by the patient (e.g. ***PSV***), adverse settings or sensor failure can lead to insufficient ventilation.
► To maintain a minimal ventilation of the patient, set the respiratory rate to a suitable value.

⚠ WARNING
Risk of insufficient ventilation
The spontaneous minute volume ***MVspon*** indicates the volume which results from spontaneous breathing and from pressure-supported spontaneous breathing. If the patient frequently triggers pressure-supported breaths as a result of small tidal volumes, a large part of ***MVspon*** will be achieved by mechanical ventilation and not by spontaneous breathing of the patient. In this case, ***MVspon*** shows a high value although the actual spontaneous minute volume is very low.
► Do not base therapy decisions solely on the value displayed for ***MVspon***.

7.3.7 Low-flow anesthesia and minimal-flow anesthesia

This device is suitable for and optimized for carrying out low-flow anesthesia and minimal-flow anesthesia. Functions and special characteristics are explained in the following.

Due to the patient's rebreathing, moisture condenses in the breathing circuit and the breathing system, particularly during low-flow anesthesia (flow ≤1.0 L/min). The breathing system warmer reduces this condensation.

In particular cases, e.g., during minimal-flow anesthesia lasting several hours, condensed water may accumulate in the piston ventilator.

The device can detect condensed water in the piston ventilator and in the breathing hoses. A message is displayed when condensed water is detected.

Dräger recommends using water traps in the breathing circuit.

7.3.8 Ventilating pediatric patients and neonates

For tidal volumes below 300 mL:

► Use suitable ventilation accessories, see chapter "Selecting and connecting patient-specific accessories" starting on page 67.

7.4 Special forms of therapy

The device has the following additional operation modes:

– External fresh-gas outlet
– Pause
– CBM mode

7.4.1 External fresh-gas outlet

Prerequisites:

– The device has the "External fresh-gas outlet" option.
– A non-rebreathing system is connected, see page 73.

Redirecting the fresh gas to the external outlet

The FiO_2 measurement with the O_2 sensor is not possible when the external fresh-gas outlet is in use, as the fresh gas is not passed through the internal breathing system.

1. **⚠ CAUTION**
   Risk of faulty gas delivery
   With non-rebreathing systems, O_2, CO_2, and any anesthetic gases must be monitored.
   ► Connect the sample line to the non-rebreathing system and the integrated patient-gas measurement module or the anesthetic gas monitor.

   ⚠ CAUTION
   Risk of gas contamination
   When the device's integrated patient-gas measurement module is used, the extracted sample gas is also returned to the internal breathing system during operation with an external fresh-gas outlet.
   ► Using a breathing hose, establish a closed connection between the inspiratory port and the expiratory port. Flush the breathing system each time patients or anesthetic gas are changed!

   Start the ***Ext. FGO*** operation mode.
2. Adjust the fresh-gas delivery. Set the vaporizer if required.

7.4.2 *Pause* mode

In ***Pause*** mode, ventilation is stopped. This mode is useful for short-term interruptions to a therapy such as, e.g., intraoperative suctioning of mucus or relocation of the patient.

This mode is also useful during regional anesthesia. The patient's respiration can be monitored via the sample gas measurement without distracting alarms being issued.

Gas delivery is also stopped with electronically controlled gas mixers. The gas concentration measurement remains active and waiting for respiratory phases.

The device remains in this operation mode until the user switches to a different ventilation mode. The ***Timer*** therapy control defines the period of time after which an alarm is issued. This alarm reminds the user to start the ventilation manually again.

Setting the ***Timer*** therapy control to ***Off*** deactivates the alarm. The total elapsed time in the ***Pause*** operation mode is also displayed.

To reduce contamination of the ambient air with anesthetic gases through an open Y-piece, use this operation mode for, e.g., regional anesthesia or short breaks in therapy such as disconnection or intubation.

7.4.2.1 Activating *Pause*

1. Start the ***Pause*** operation mode.
2. Adjust the ***Timer*** therapy control if necessary.

7.4.2.2 Returning to the previous mode

1. Touch the ***Resume ventilation*** button.
2. Confirm the ventilation mode.

For more information, see page 171.

7.4.3 CBM mode

The CBM mode allows patient monitoring without unnecessary alarms during extracorporeal oxygenation of the patient by a heart-lung machine.

Properties of CBM mode:

– All gas concentrations are measured independently of the respiratory phases.
– The CO_2 apnea alarms and pressure apnea alarms are inactive.

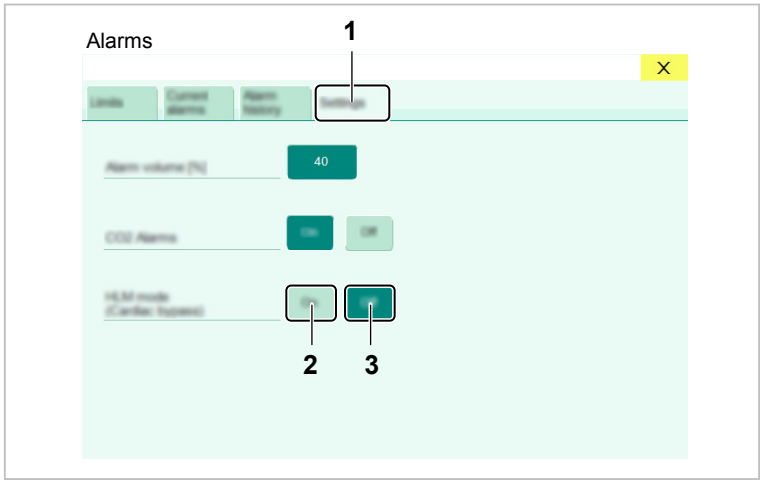
The CBM mode can be used in all active ventilation modes.

When ventilation modes are changed, the CBM mode remains active. Changing to the standby mode deactivates the CBM mode.

Deactivating the CBM mode activates the apnea monitoring.

Activating

1. Open the ***Alarms*** dialog.
2. Touch the ***Settings*** tab (1).



35307

3. For ***Cardiac bypass mode (CBM)***, touch the ***On*** button (3).

Deactivating

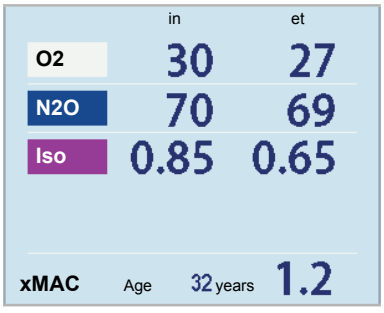
Deactivate the CBM mode optionally as follows:

► For ***Cardiac bypass mode (CBM)***, touch the ***Off*** button (2):
► In the main menu bar, touch the ***Exit CBM*** button.

7.5 Using fields with special functions

7.5.1 Breathing gas measurement and xMAC display (MAC multiple)

Prerequisite: The device has the "Integrated patient-gas measurement module" option.



35310

The MAC value is a guideline for anesthetic agent delivery.

The device displays the measured inspiratory and expiratory values for ***O2***, ***N2O***, and anesthetic gases as well as the ***xMAC*** in the monitoring area. The nitrous oxide concentration or anesthetic gas concentration is only displayed when it is not zero.

The xMAC is the MAC multiple calculated from the current expiratory measured values and the age-dependent MAC values. If no respiratory phases are detected, expiratory values and xMAC cannot be displayed.

The integrated MAC algorithm is based on the MAC values shown in the following table. These values are guiding values only. The binding values are specified on the package information leaflet of the anesthetic agent.

The MAC values depend on the age of the patient. The values specified in the table apply to a patient age of 40 years.

	1 MAC corresponds to the following concentration: (In 100 % O_2)
Halothane	0.77 Vol%
Enflurane	1.7 Vol%
Isoflurane	1.15 Vol%
Desflurane	6.0 Vol%
Sevoflurane	2.1 Vol%
N_2O	105 Vol%

The age-adjusted MAC values are calculated according to the equation of W.W. Mapleson (British Journal of Anaesthesia 1996, pp. 179-185).

The equation applies to patients older than 1 year.

$MAC_{age\text{-}adjusted} = MAC^{1)} \times 10^{(-0.00269 \times (age - 40))}$

For gas mixtures, the respective multiples for N_2O and anesthetic agents are summed up according to the following equation:

$$xMAC = \frac{\text{Exp. conc. agent}_1}{MAC_{age\text{-}adjusted\ agent_1}} + \frac{\text{Exp. conc. agent}_2}{MAC_{age\text{-}adjusted\ agent_2}} + \frac{\text{Exp. conc. } N_2O}{MAC_{age\text{-}adjusted\ N_2O}}$$

7.5.1.1 Example

Exp. Isoflurane = 0.65 Vol%
Exp. N_2O = 69 %
Age = 32 years

$MAC_{age\text{-}adjusted}$ for Iso: $MAC^{2)}$ = 1.21 Vol%
$MAC_{age\text{-}adjusted}$ for N_2O: $MAC^{2)}$ = 110 Vol%

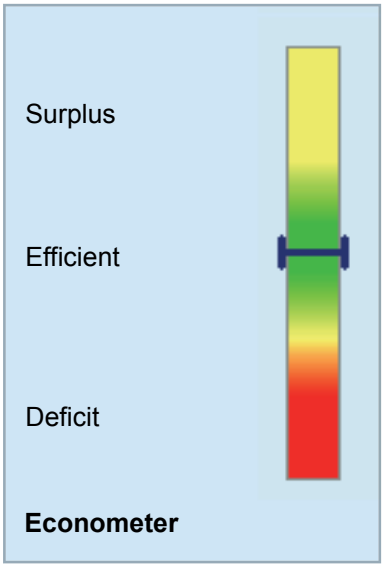
xMAC = 0.54 + 0.63 = 1.2

The influence of other drugs (opioids or intravenous hypnotics) is not considered in the xMAC calculation.

7.5.2 Econometer

Prerequisite: The device has the "Advanced gas monitoring" option.

During operation, the device monitors the breathing bag for sufficient filling.



35322

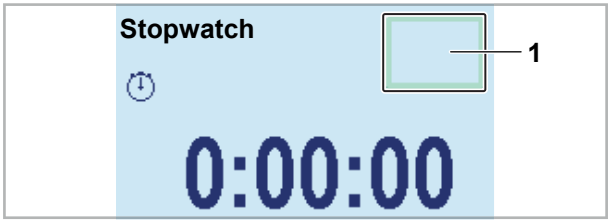
The bar graph indicates whether the device is supplied with sufficient fresh gas.

1) 40 years
2) 32 years

Range	Color	Meaning
Surplus	Yellow	Indication of an opportunity to save fresh gas and, therefore, volatile anesthetic agents
Efficient	Green	– No action necessary – Breathing bag sufficiently filled – Sufficient reserve capacity available
Deficit	Red	– Insufficient fresh-gas supply – Check the filling of the breathing bag. If necessary, fill up the breathing bag, e.g., with the O2 flush.

An insufficiently filled breathing bag can trigger the ***Fresh gas low or leakage*** or ***Emergency air inlet activated*** alarms, for example.

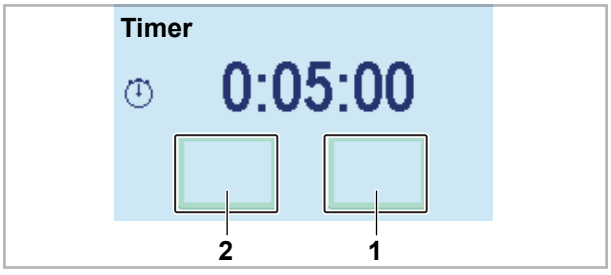
7.5.3 Stopwatch



Using the stopwatch

1. Touch the ***Start*** button (1) to start.
2. Touch the ***Stop*** button (1) to stop.
3. To reset the stopwatch to zero, touch the ***Reset*** button (1).

7.5.4 Timer



Setting the timer

1. Touch the ***Set*** button (1) or the parameter field.
2. Set the timer.

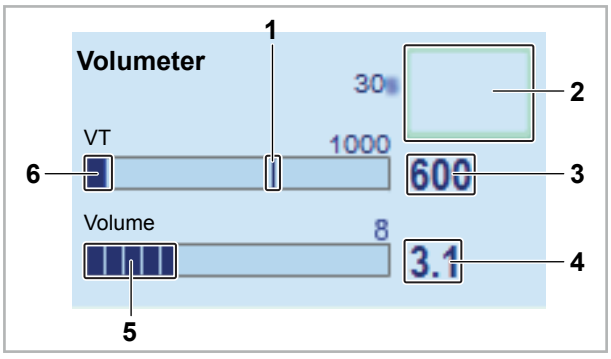
Using the timer

The timer always starts with the last time set.

1. Touch the ***Start*** button (1) to start.
2. Touch the ***Stop*** button (1) to stop.
3. To reset the timer to zero, touch the ***Reset*** button (1).

7.5.5 Volumeter

The volumeter is used for observing and assessing the ventilation.



35553

The bar graph indicates the inspiratory and expiratory tidal volume.
At the end of the inspiration, the delivered tidal volume is displayed as a bar (1).
At the end of the expiration, the difference between inspiratory and expiratory tidal volumes (6) is displayed.
The expiratory tidal volume is displayed next to the bar graph (3).

Using the volumeter (minute volume measurement)

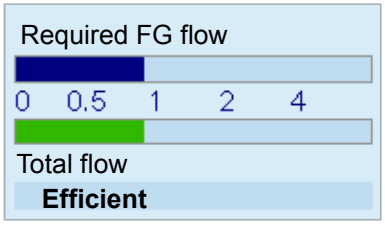
1. Touch the ***Start*** button (2) to start.
   The bar graph displays the individual measured spontaneous breaths in segments (5). The summed volume (4) is displayed next to the bar graph.
2. Touch the ***Stop*** button (2) to stop.
3. To reset the volumeter and time display to zero, touch the ***Reset*** button (2).

The volumeter stops automatically after 60 seconds. The measured values are displayed for 4 minutes and then deleted.

7.5.6 Low-flow wizard

Prerequisite: The device has the "Advanced gas monitoring" option.

The low-flow wizard displays bar graphs for the required fresh-gas flow and the current total flow. Both bar graphs are to the same scale.



35554

An evaluation of the total flow is displayed below the bar graph:

Evaluation	Color	Meaning
Too high	Yellow	The fresh-gas flow is possibly too high. If the fresh-gas flow can be reduced, both fresh gas and anesthetic agent will be saved.
Efficient	Green	No action is necessary.

Evaluation	Color	Meaning
Too low	Red	The fresh-gas flow is too low. ▶ Check the fresh-gas flow. ▶ Check the position of the breathing bag.
Refill bag	Red	The fresh-gas flow is too low. ▶ Check the filling of the breathing bag. If necessary, fill up the breathing bag, e.g., with the O2 flush.

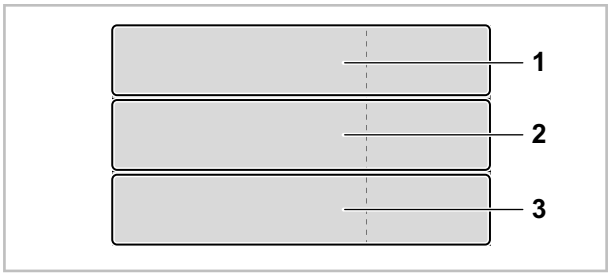
An insufficient fresh-gas flow may trigger the ***Fresh gas low or leakage*** or ***Emergency air inlet activated*** alarms, for example.

7.6 Customizing the screen display

7.6.1 Available views

The following views are available:

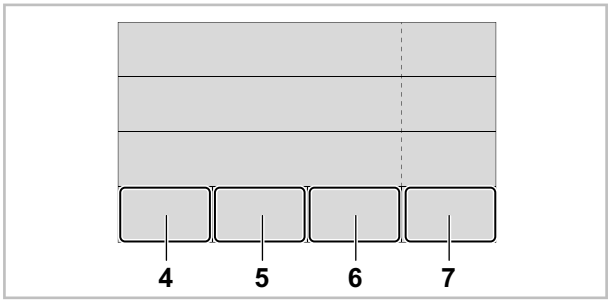
Standard view



35683

Up to three waveforms (1), (2), and (3) are displayed along with their associated parameter fields.

Expert view



35685

In addition to the standard view, the 4 additional parameter fields (4), (5), (6), and (7) are displayed.

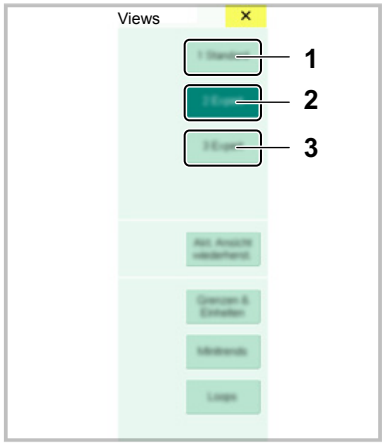
7.6.2 Changing the view

The view can be changed as follows:

– ***Views...*** button
– ***View*** button

Changing with the *Views...* button

1. Touch the ***Views...*** button.



35688

2. Touch the button for the desired view.
   – Opens the standard view (1)
   – Opens an expert view (2) or (3)

The views can be renamed, see page 166.

Changing with the *View* button

► Touch the ***View*** button.
The screen displays the 2nd view .

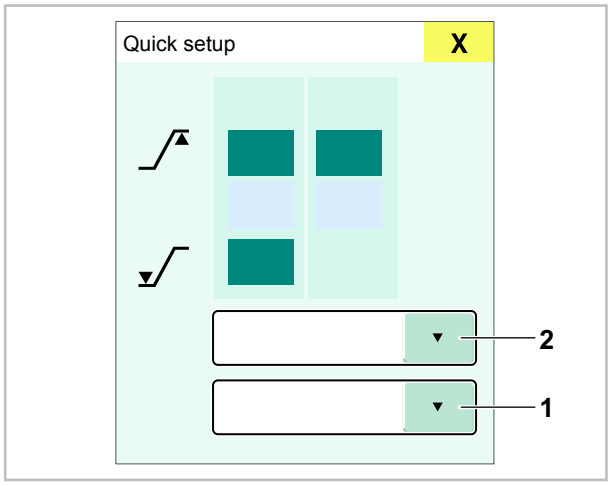
► Touch the ***View*** button.
The screen displays the 3rd view .

► Touch the ***View*** button.
The screen displays the 1st view .

7.6.3 Customizing the current view

Waveforms and parameter fields can be customized as follows:

1. Touch the waveform or parameter field.
   The ***Quick setup*** dialog opens.



2. ⚠ **WARNING**
   Risk due to inadequate monitoring
   National and medical regulations may require certain parameters to be displayed.
   ► Always consider the relevant regulations when configuring the screen layout.

   For ***Content*** (1), select the desired content.
   For a list of the possible screen content, see page 184.
3. For ***Scale*** (2), select the desired setting.

7.6.3.1 Restoring the current view

The changes to the current view can be canceled.

1. Open the ***Views*** dialog.
2. Touch the ***Restore current view*** button.

7.6.4 Using loops

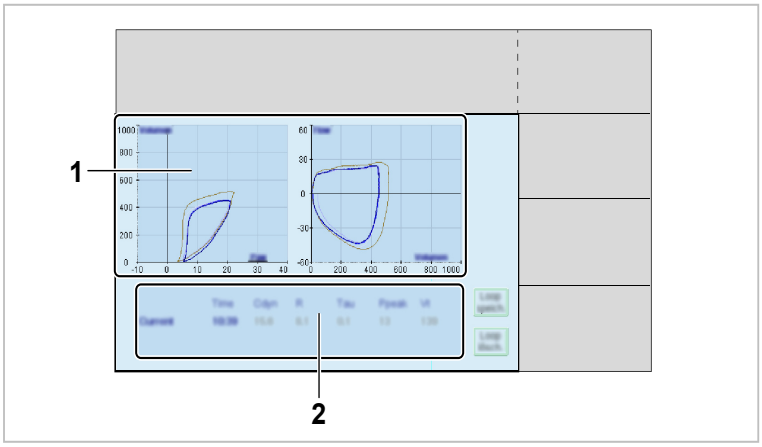
Prerequisite: The device has the "Advanced ventilation monitoring" option.

The following loops are available:

– Pressure-Volume loop
– Flow-Volume loop

Displaying loops

1. Open the ***Views*** dialog.
2. Touch the ***Loops*** button.

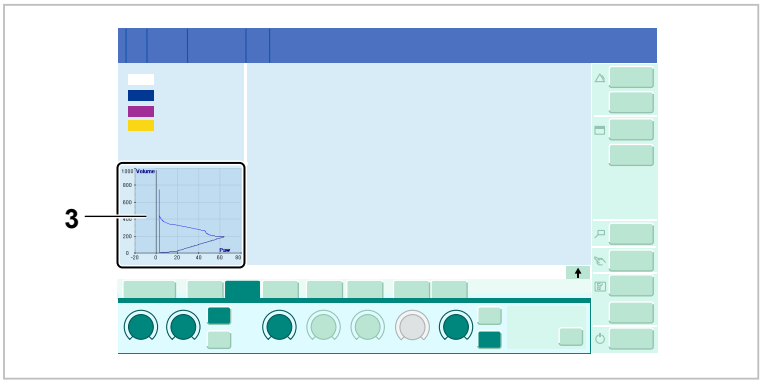


35866

The following information is displayed:

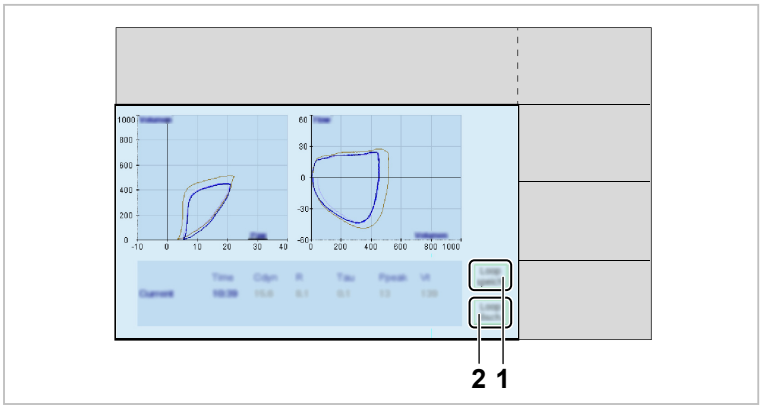
– The current loop (1) and 5 previous loops
– The parameters (2) ***Cdyn***, ***R*** and ***TC***

On the device version with integrated patient-gas measurement module, the area (3) can be configured so that the pressure-volume loop is displayed:



35868

Saving or deleting reference loops



36396

Saving the reference loop:

► Touch the ***Save ref.*** button (1).

Deleting the reference loop:

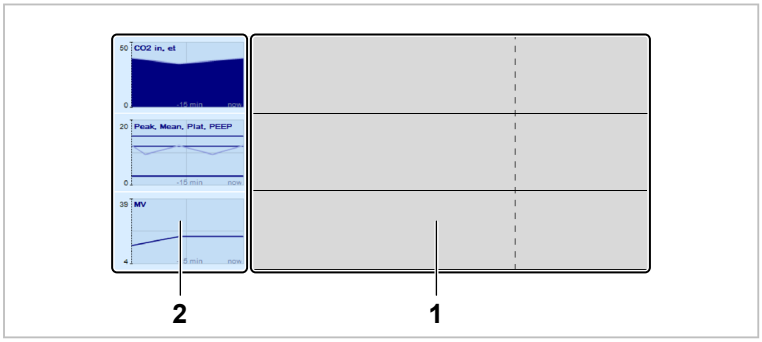
► Touch the ***Delete ref.*** button (2).

For area (3), these buttons are displayed in the ***Quick setup*** dialog.

7.6.5 Displaying mini-trends

Prerequisite: The device has the "Advanced trends" option.

Mini-trends (2) can be displayed for the waveforms (1).



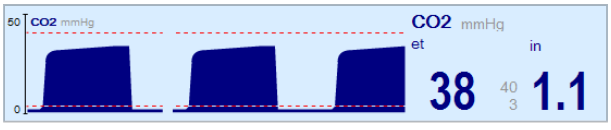
35870

1. Open the ***Views*** dialog.
2. Touch the ***Mini-trends*** button.

For larger and more detailed graphical and numerical trends, see page 114.

7.6.6 Displaying alarm limits and units of measurement

The alarm limits and the units of measurement can also be displayed in the waveform and parameter fields.

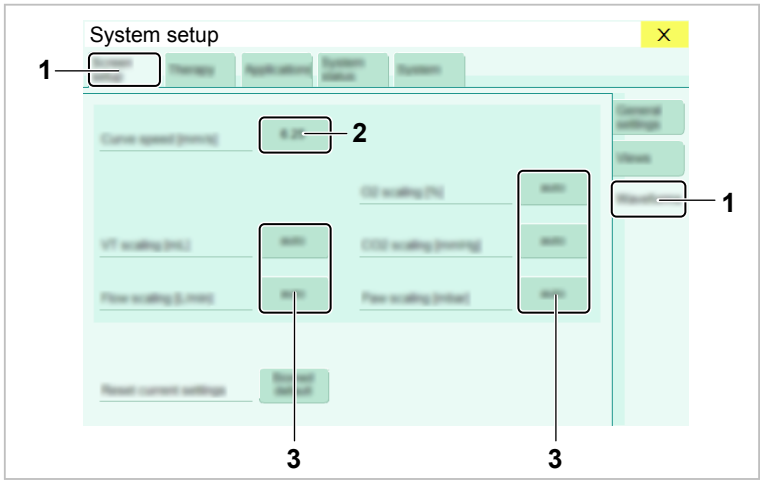


35874

1. Open the ***Views*** dialog.
2. Touch the ***Limits & units*** button.

7.6.7 Adjusting the sweep speed and the scale

1. Open the ***System setup*** dialog.
2. Touch the ***Screen*** > ***Waveforms*** tab (1).



35875

Setting the sweep speed:

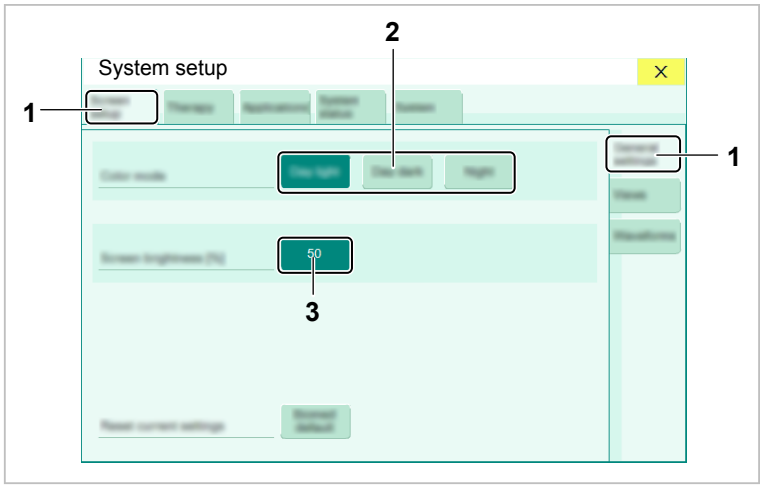
► Touch the button (2) and set the sweep speed.

Adjusting the waveform scale:

► To change the scale, touch one of the buttons (3) and select the value.

7.6.8 Changing the color scheme and the screen brightness

1. Open the ***System setup*** dialog.
2. Touch the ***Screen*** > ***General*** tab (1).



35883

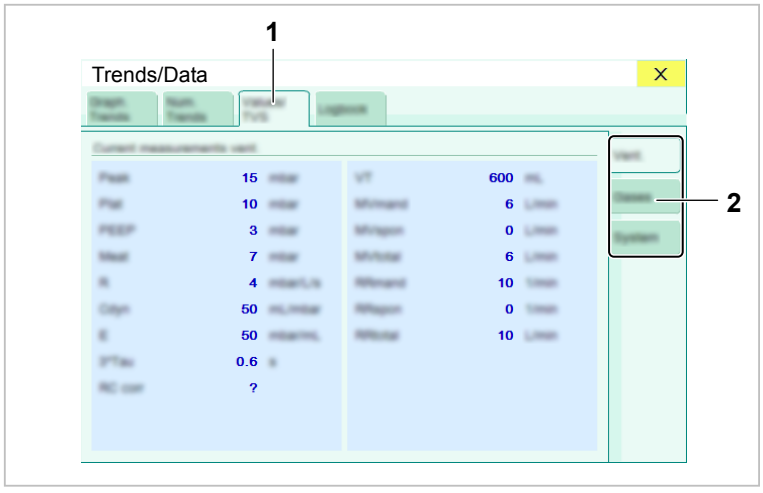
3. Set the color scheme (2).
4. Set the screen brightness (3).

7.7 Displaying additional data

7.7.1 Viewing current measured values

In operation mode, there are tabular overviews available for various measured values.

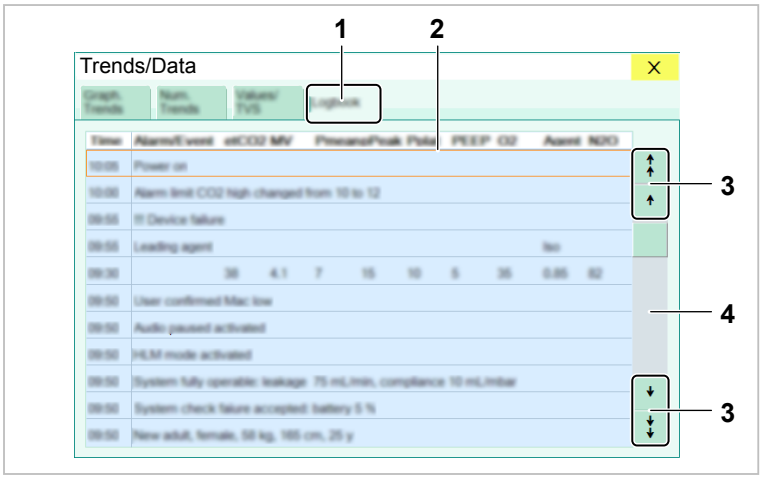
1. Open the ***Trends/Data*** dialog.
2. Touch the ***Values*** tab (1).
   The vertical tabs (2) contain various combinations of parameters.



7.7.2 Logbook

The logbook can save up to a maximum of 20000 entries. The entries in the logbook cannot be deleted and are retained even after the device has been turned off and on again or following a power supply failure. When the storage limit is reached, the oldest entries are overwritten. Logbook data are displayed in table form.

1. Open the ***Trends/Data*** dialog.
2. Touch the ***Logbook*** tab (1).



Use the rotary knob or the arrow buttons (3) to scroll the cursor (2) up or down in the logbook. To scroll quickly, touch the gray area (4).

Creating entries and associated settings, see page 121.

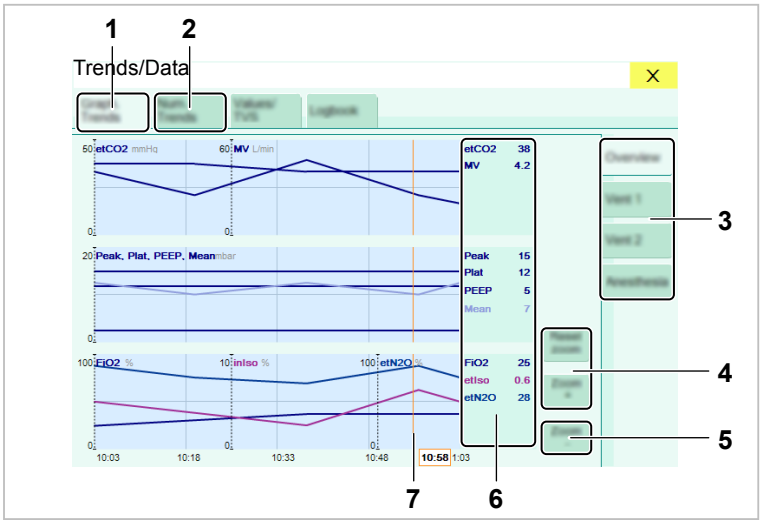
7.7.3 Trends

Prerequisite: The device has the "Advanced trends" option.

Trends are displayed in the form of a graphic or a table.

1. Open the ***Trends/Data*** dialog.
2. Touch the ***Graphical trends*** tab (1) or the ***Tabular trends*** tab (2).

The following illustration shows the graphical trend:



35917

The vertical tabs (3) contain various combinations of parameters.

Zooming

In both trend displays, the displayed time period can be enlarged or diminished.

Changing the time period:

► Touch the ***Zoom +*** or the ***Zoom -*** button (4):

Displaying the standard time period and the current point in time:

► Touch the ***Reset zoom*** button (5).

Moving the cursor

The exact measured values for a specific point in time are displayed numerically in area (6). To view the values, move the cursor to the corresponding position.

The following options are available for moving the cursor:

► Use the rotary knob to move the cursor (7).

► Touch the corresponding area on the screen.

7.7.4 Displaying installed options

Listing of the additionally installed software options.

1. Open the ***System setup*** dialog.
2. Touch the ***Licenses/Options*** tab.

7.7.5 Displaying an overview of accessories and consumptions

1. Open the ***System setup*** dialog.
2. Touch the ***System status*** tab.

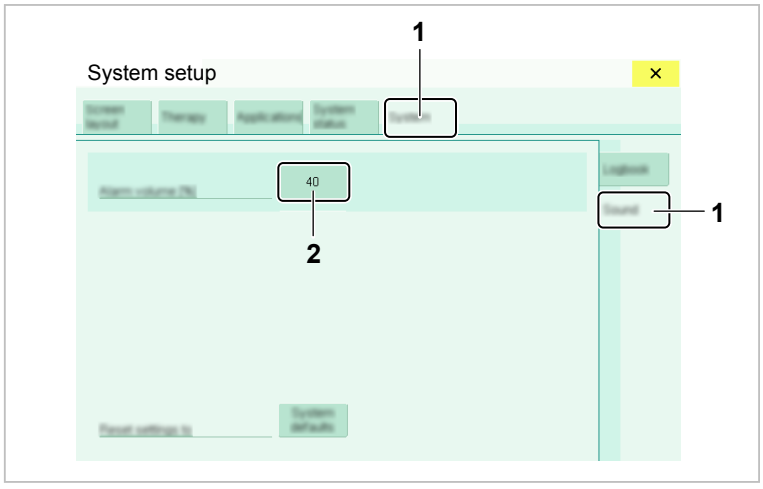
Vertical tab	Overview
Accessories	Accessories (when Dräger Infinity ID accessories are used) and information as to when the accessory must be replaced.
Supply	Status display of the connected gas supplies and power supplies
Consumption	Gas consumptions during operation: – For the current case Gas consumptions in ***Standby***: – For the last case – Since the last reset

At ***Standby*** > ***System setup*** > ***System status*** > ***Consumption*** the gas consumption levels can be reset to zero, see page 180.

7.8 Setting the volume

1. Open the ***System setup*** dialog.
2. ⚠ **CAUTION**
   Risk of an operating error
   During operation in louder environments, the acoustic alarm signals might not be heard.
   ► Always set the alarm tone to be sufficiently loud.

   Touch the ***System*** > ***Sound volume*** tab (1).



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3. For ***Alarm volume*** (2), set the desired value.

7.9 Adjusting the alarms

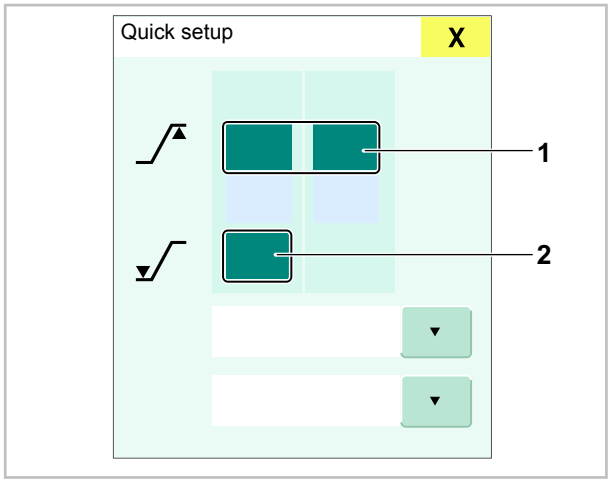
7.9.1 Setting the alarm limits

For a current case, the alarm limits can be set in 2 ways:

– Setting using the ***Quick setup*** dialog
– Setting using the ***Alarms*** dialog

Setting using the *Quick setup* dialog

1. Touch the respective waveform or the parameter field.
2. Set the upper alarm limit (1).



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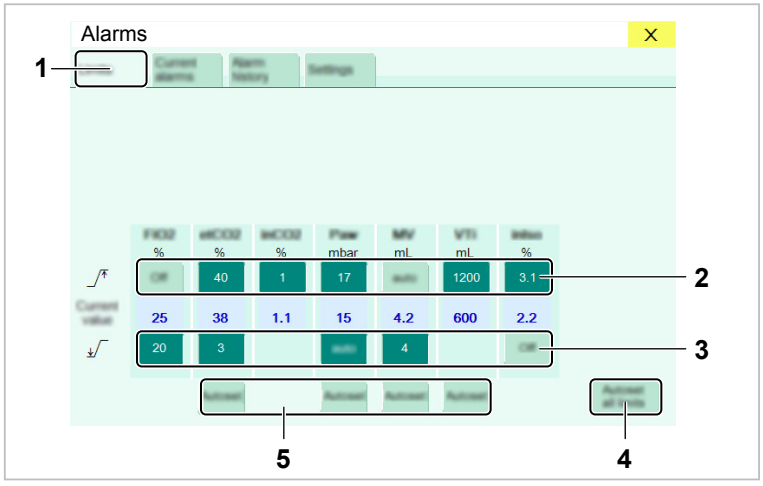
3. Set the lower alarm limit (2).

Manual setting

In the ***Alarms*** dialog, the alarm limits can be set either manually or automatically.

1. Open the ***Alarms*** dialog.
2. Open the ***Limits*** tab (1).



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3. Set the upper alarm limit (2).
4. Set the lower alarm limit (3).

Automatic setting

Alarm limits can be automatically adapted to current measured values or set values.

1. Open the ***Alarms*** > ***Limits*** dialog.
2. To adjust the alarm limits for **one** individual parameter, touch and confirm one of the ***Autoset*** buttons (5).
   To adjust the alarm limits for **all** parameters, touch and confirm the ***Autoset all*** button (4).

The function for adjusting all alarm limits can be called up directly with the ***Autoset limits*** button in the main menu bar.

Only use the automatic adjustment when measured values and set values are stable.

The lower alarm limit for the ***xMAC*** level is also adjusted during automatic setting, see page 118.

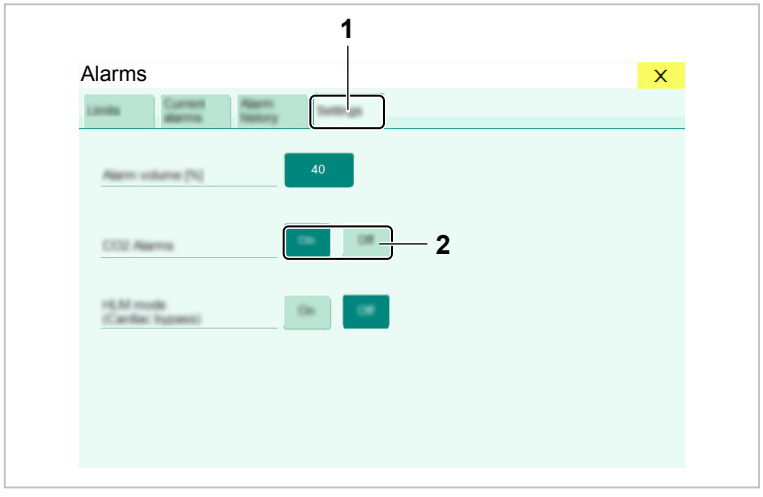
Configuration and algorithm, see page 169.

7.9.2 Activating and deactivating CO_2 alarms

Prerequisite: The device has the "Integrated patient-gas measurement module" option.

The CO_2 monitoring (alarms for ***inCO_2***, ***etCO_2***, and ***CO_2*** apnea) can be activated or deactivated.

1. Open the ***Alarms*** dialog.
2. Touch the ***Settings*** tab (1).



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3. For ***CO_2 alarms***, touch the button (2):
   On: Alarms are activated.
   Off: Alarms are deactivated.

Or

► Use the ***CO_2 alarms off*** button in the main menu bar to activate or deactivate the alarms.

This button is only visible in the following ventilation modes:

- ***Manual / Spontaneous***
- ***External fresh-gas outlet***
- ***Pause***

The alarm system is immediately activated when the CO_2 monitoring is activated.

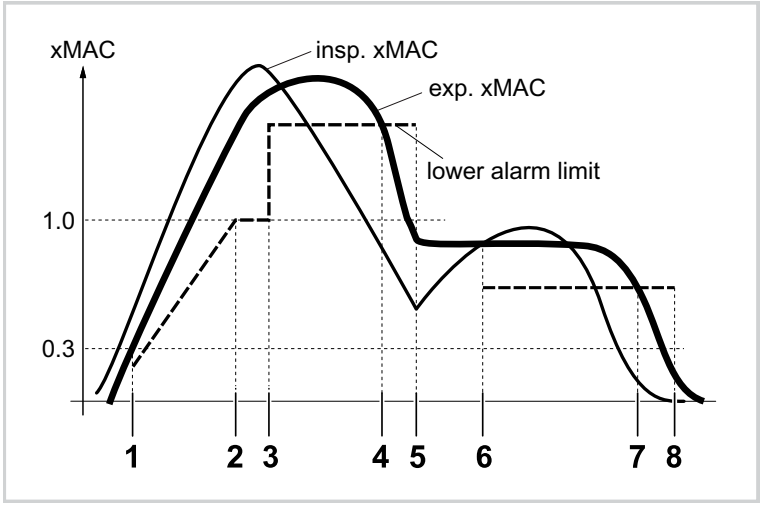
Deactivation is indicated in the header bar and in the parameter field by the ⛥ symbol.

7.9.3 Automatic xMAC monitoring

Prerequisite: The device has the "Integrated patient-gas measurement module" option.

The xMAC monitoring is automatically activated as soon as the following conditions are met:

- Anesthetic gas is administered.
- The inspiratory xMAC value is greater than the expiratory xMAC value.
- The expiratory xMAC value reaches approximately 0.3.



If the xMAC value rises, the xMAC monitoring (1) is activated and the lower alarm limit for the xMAC level is automatically adapted to the anesthetic gas concentration. The lower alarm limit (2) can reach a maximum value of 1.0.
The lower alarm limit can be recalculated by touching the ***Autoset*** button (3). This allows the alarm limit for the ***xMAC low*** alarm to be adjusted in special anesthesia situations and to exceed the value of 1.0 if necessary.
If the expiratory xMAC value falls below the alarm limit (4 or 7), the device issues the ***xMAC low*** alarm with low priority. If the alarm is not acknowledged with the ***ALARM RESET*** button, the priority is raised to medium priority after 60 seconds.

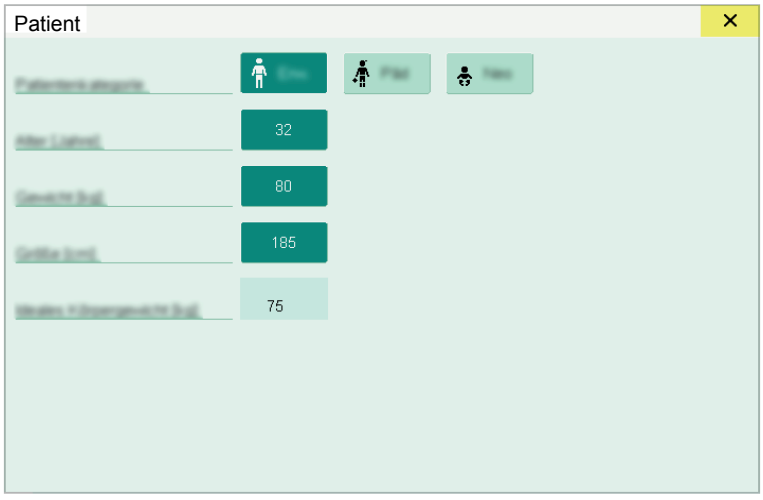
7.9.4 Deactivating the automatic xMAC monitoring

If the ***xMAC low*** alarm (4 or 7) is acknowledged with the ***ALARM RESET*** button (5 or 8), the monitoring is deactivated. This prevents renewed alarms as a result of the anesthetic gas concentration continuing to fall at the end of anesthesia (8). If the anesthesia is continued (5), the monitoring will be automatically reactivated as soon as the inspiratory xMAC value rises above the expiratory xMAC value (6).
In CBM mode, the lower alarm limit is adjusted so that no alarm is issued during this time. Similarly, the value is not limited to 1.0 during this time.

7.10 Changing the patient data

Patient data can be changed during operation.

1. Open the ***Patient*** dialog.



2. Modify the patient data.

Changes influence the therapy suggestions, among others, which is indicated by the position of the arrow ▼ on the therapy controls.

The current therapy settings remain unaffected. Observe the following information: "Influence of patient category, weight, and age on device behavior", page 311.

When the patient category is changed, the age, weight, and height are automatically adapted so that they remain within the described limits, see page 172.

7.11 Exporting data

This device enables the export of screen contents, trends, and data on a USB mass storage device.

7.11.1 General information

Prerequisite: USB mass storage device is connected to the USB port.

During a saving process, the button turns dark green.

The data are stored in the "Draeger\ExportData" directory.

7.11.2 Exporting the screen contents

The screen contents can be exported to a USB mass storage device as a screenshot.

► Touch the ***Export screenshot*** button in the main menu bar.

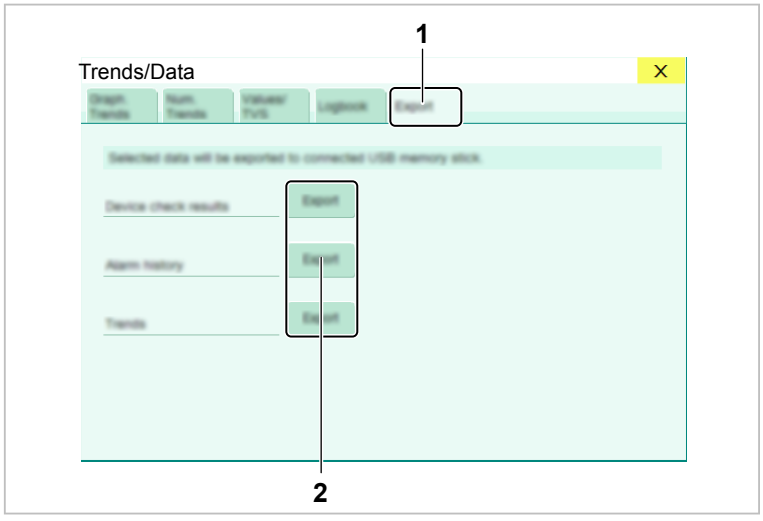
The screenshot will be saved as a ".png" file.

7.11.3 Exporting trends and data

In the standby mode, the following data can be exported to a USB mass storage device:

– System test results
– Logbook
  Selection from the following time periods is possible:
  – Last case
  – Today
  – All
– Alarm logbook
– Trends

1. Open the ***Trends/Data*** dialog.
2. Touch the ***Export*** tab (1).



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3. Touch the respective button (2).

The data will be saved as a ".txt" file.

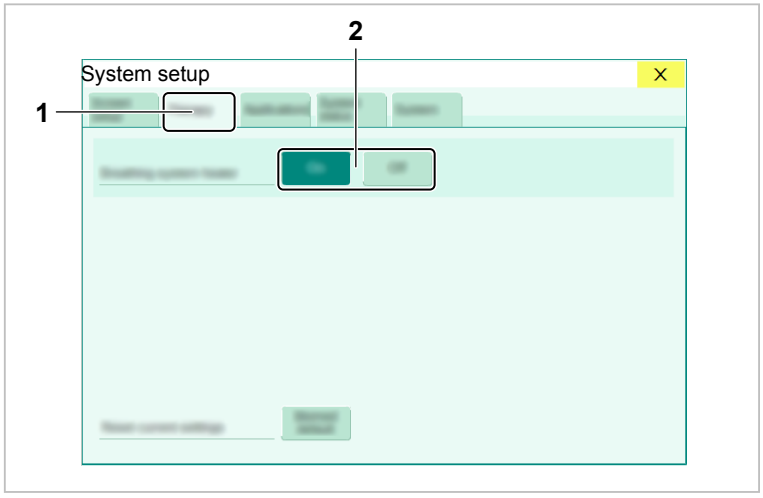
7.12 Other settings

7.12.1 Switching the breathing system warmer on or off

The breathing system warmer can be switched off in special situations (e.g., for intentional reduction of the body temperature of the patient).

1. Open the ***System setup*** dialog.

2. Touch the ***Therapy*** tab (1).



3. Touch the appropriate button (2).

When switching to standby mode, the heater is reset to the value configured in the system setup.

⚠ CAUTION
Risk due to faulty or switched-off breathing system warmer
Without the breathing system warmer, increased condensation may occur in the breathing system.

► Increase the fresh-gas flow if necessary. Remove the condensed water from hoses, water traps, and the breathing system regularly. Have service personnel repair the faulty breathing system warmer.

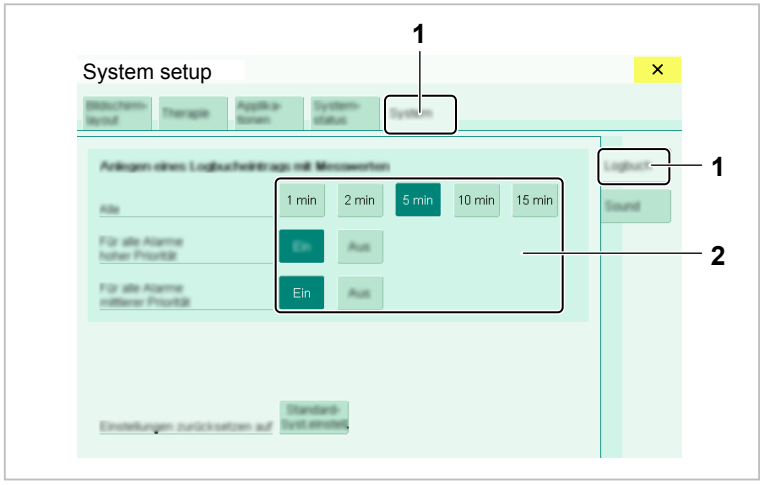
7.12.2 Creating additional logbook entries

The following events can generate a logbook entry with measured values for the parameters ***etCO2***, ***MV***, ***Pmean***, ***PIP***, ***Pplat***, ***PEEP***, ***FiO2***, expiratory concentration of the primary anesthetic gas, and ***etN2O***:

– Settable interval
– Alarms with high or medium priorities

1. Open the ***System setup*** dialog.

2. Touch the ***System*** > ***Logbook*** tab (1).



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3. Touch the appropriate button (2).

7.12.3 Resetting user-specific settings

Changes made in the ***System setup*** dialog during operation can be reset to the default settings.

1. Open the ***System setup*** dialog.
2. Open the corresponding page.
3. Touch the ***System defaults*** button and confirm.

7.13 Ending the therapy

7.13.1 Switching to the standby mode

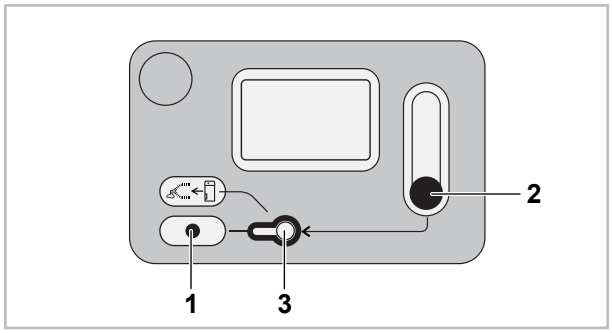
1. Touch the ***Standby...*** button in the main menu bar.
   Or
   Press the ⏻ key below the screen.
2. Confirm with the rotary knob.
3. With mechanically controlled gas mixer:
   Close the flow control valves.

7.13.2 O_2 insufflation

7.13.2.1 Overview

On the electronically controlled gas mixer, O_2 insufflation is performed using the O_2 flowmeter. On the mechanically controlled gas mixer, O_2 insufflation is performed using an integrated O_2 flowmeter or an external O_2 flowmeter.

Electronically controlled gas mixer:



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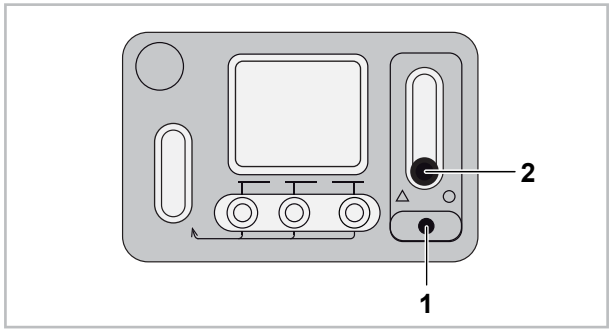
Prerequisite: The O2 switch is horizontal in the ***Aux. O2*** position (3).

Mechanically controlled gas mixer:



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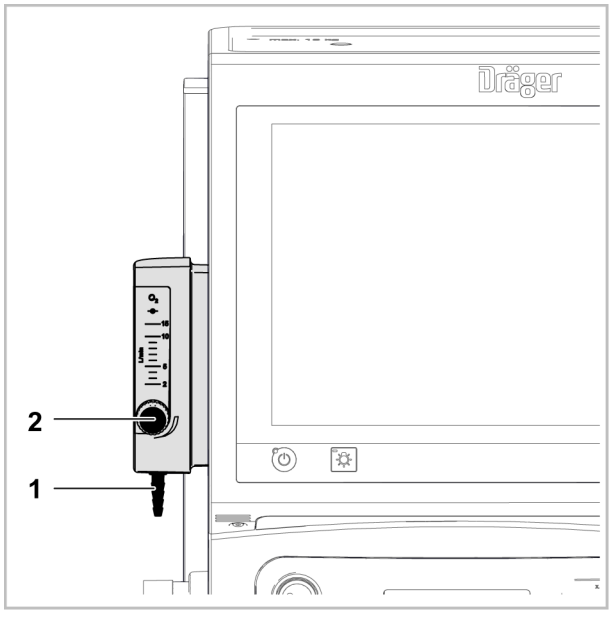
Prerequisite: The mechanically controlled gas mixer is equipped with the "O2 flowmeter" option.

External O2 flowmeter:



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Prerequisite: The device is equipped with an external O2 flowmeter. This option is only available for a device with a mechanically controlled gas mixer.

7.13.2.2 Using O_2 insufflation

Procedure for all 3 variants:

1. **⚠ WARNING**
   Risk of fire
   In combination with oxygen or nitrous oxide, ignition sources such as electrosurgical devices and laser surgical devices can cause fires.
   - ► Prevent leakage, e.g., at endotracheal tubes, laryngeal mask airways, face masks, Y-piece, breathing system including hoses, filters, and breathing bag, at the external fresh-gas outlet, and at the outlet for O_2 insufflation.
   - ► Use only intact and leak-free hoses at the outlet for O_2 insufflation.
   - ► Before beginning laser surgery or electrosurgery, flush with sufficient air (<25 % O_2), and flush beneath the surgical drapes as well.
   - ► If ignition sources are present, close the flow control valve on the O_2 flowmeter to the end position.
   - ► When O_2 outlets are in use (e.g., for insufflation), do not use any ignition sources in the immediate vicinity.
   - ► Do not position oxygen sources in the vicinity of ignition sources, e.g., electrical connectors.

   Connect the appropriate accessories to the outlet for O_2 insufflation (1).
2. **⚠ WARNING**
   Risk due to overpressure
   When the patient is connected to the outlet for O_2 insufflation without a release valve, increased pressure may be applied to the patient.
   - ► Only connect the patient in a way that allows excess gas to escape (e.g., through a release valve).

   Connect the patient using a mask or nasal cannula.
3. Open the flow control valve (2) to begin O_2 insufflation.

Ending O_2 insufflation:

► Close the flow control valve (2).

7.14 Change of patient

7.14.1 Cleaning and disinfecting the workstation

► Clean and disinfect the anesthesia workstation in accordance with the infection prevention policy of the hospital, see "Reprocessing" on page 222.

7.14.2 Checking or replacing consumables

Prerequisite: The device is in standby mode.

Integrated patient-gas measurement module

1. ⚠ **WARNING**
   Risk of infection
   The water trap may contain infectious fluid.
   ► Proceed carefully when emptying and take protective measures if necessary.
   ► Follow the infection prevention policies and reprocessing regulations of the healthcare facility.

   Check the water trap of the patient-gas measurement module (PGM) for leakage. If necessary, empty or replace the water trap.

2. ⚠ **WARNING**
   Risk of infection
   Used sample lines and water traps may be infectious due to the breathing gases that passed through them.
   ► Replace the sample line and the water trap regularly in the following situations:
   – If the sample line is connected to the filter on the Y-piece, replace it daily.
   – If there is no filter fitted to the Y-piece and the sample line is connected directly to the Y-piece, replace the sample line after every patient.
   ► Remove the sample line from the water trap.
   ► Initially leave the water trap fitted to prevent infectious fluid from spurting out. Remove the water trap only after surface disinfection.
   ► Replace the water trap after each patient.

   If no filter was used, replace the sample line and dispose of the used sample line.

Vaporizer filling level

► Check the vaporizer filling level in the sight glass. Fill the vaporizer if required.

CO_2 absorber

► Check the soda lime for discoloration and replace if necessary, see page 75.

Breathing hoses and filters

1. Replace the hoses and filters according to infection prevention policy of the hospital.
2. Connect a suitable breathing circuit and filters, see page 67.

7.14.3 Checking the device

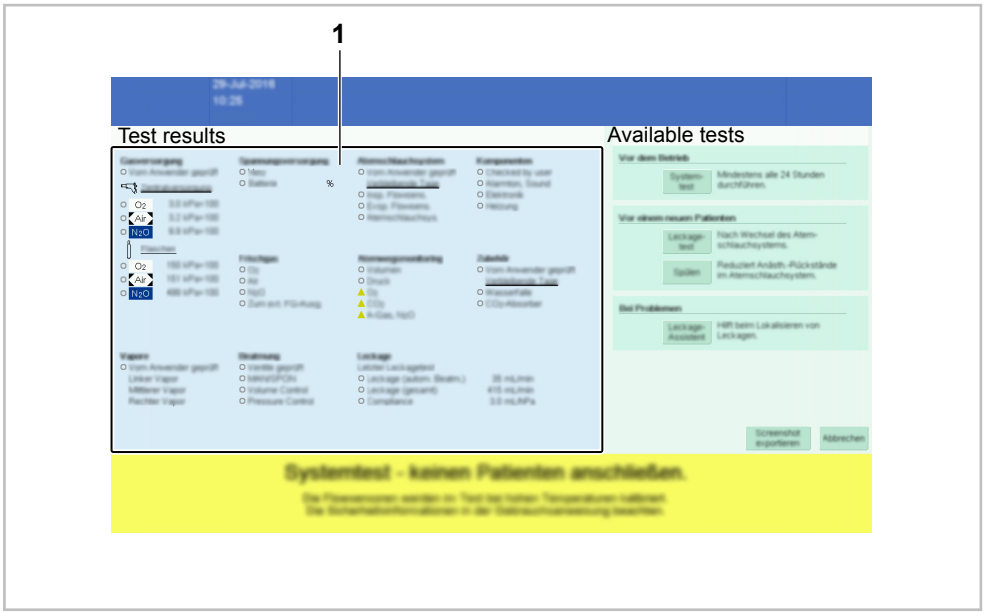
Prerequisite: The device is in standby mode.

1. Perform the leakage test, see page 127.
2. Flush the breathing system if necessary.

8 Tests

8.1 Status of the device functions

► In the standby mode, touch the ***Details...*** button or the ***Tests...*** button.



The ***Test results*** list (1) shows the results of the test last performed. The following information is displayed using different colors:

– Influence of the individual device functions on the functional integrity of the device

– Leakage values

Color	Meaning
Green	Successfully tested, fully available
Yellow	A non-critical fault has been detected. The device can be operated with restricted function.
Red	A serious fault has been detected. Operation is not possible or is forbidden.
Gray	Not tested

8.2 Available test types

System test	
Type and duration:	Automatic, approximately 8 min
Perform the test:	Daily
Description:	Initialization: – Checking of components which frequently cause operational restrictions: e.g., high leakage, incorrect setting of APL valve – Calibration of the O_2 sensor (every 7 days) The initialization takes approximately 2 to 3 minutes. Remain by the device during this time. Make corrections if necessary. Scope of test: – Calibration of all valves and sensors – Test of all device functions – Performance of leakage test

Leakage test	
Type and duration:	Automatic, approximately 2 min
Perform the test:	– After filling the CO_2 absorber – After changing the hose configuration (e.g., changed hoses, changed lengths of extendable hoses etc.) – After replacing the breathing system – After inserting the piston diaphragm – After replacing the flow sensors – If leakage at vaporizer is suspected (see "Checking a vaporizer for leakage", page 130)
Description:	– Determining leakage, system compliance, and system resistance – Calibration of valves and flow sensors, if required. In this case, the test is extended by approximately 3 minutes.

8.3 Performing the tests

8.3.1 System test and leakage test

Prerequisites:

– Electronically controlled gas mixer: Central O_2 supply or central Air supply is connected
– Mechanically controlled gas mixer: Central O_2 supply is connected
– The anesthetic gas receiving system is correctly connected.

Both tests consist of a checklist followed by an automatic test. The automatic test consists of a pretest (the initialization), which may require manual actions by the user, and a fully automatic main test.

The checklist can be presented in tabular form or as a walk-through mode.

In the system setup, it is possible to specify whether tests always start in the walk-through mode, see page 177.

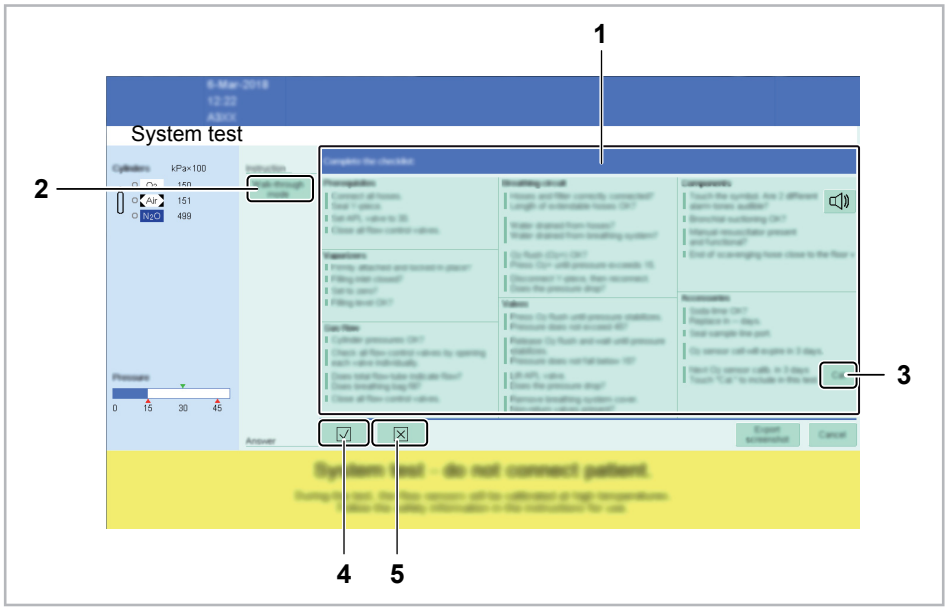
On devices with an O_2 sensor, the system test checks whether an O_2 calibration is required. If more than 7 days have passed since the last calibration of the O_2 sensor, an O_2 calibration will be automatically performed.

On devices with an integrated patient-gas measurement module, calibrations are performed regularly during operation.

1. **⚠ WARNING**
   Risk of patient injury
   During the system test, the device is pressurized.
   ► To prevent patient injury, do not perform the system test and leakage test if a patient is connected.

   Touch the button for the system test.
2. Complete the tabular checklist (1).

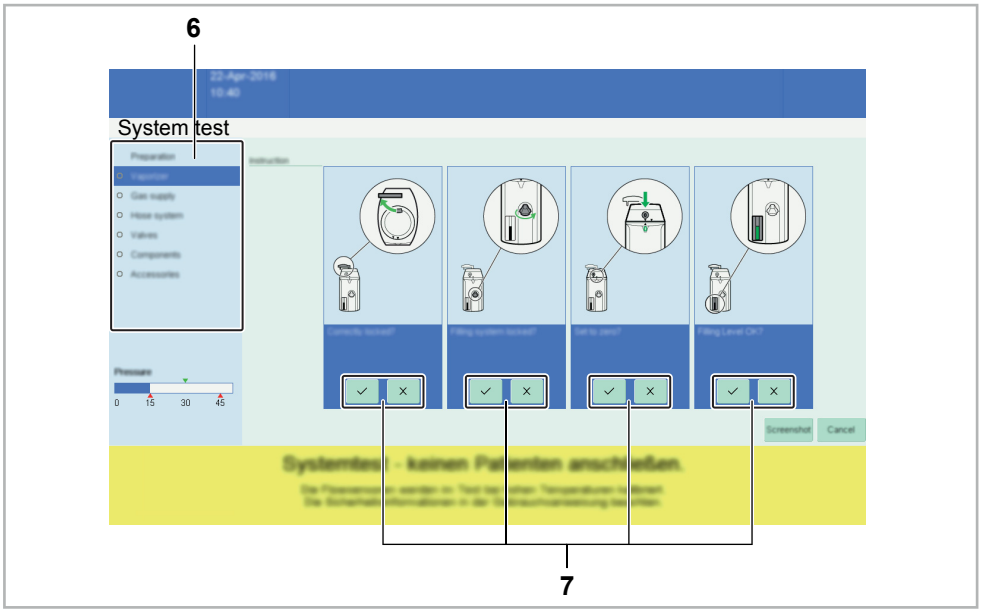
   It is possible to switch from the tabular checklist to the walk-through mode, if required. To do this, touch the button (2). For further information see: "Checklist in the walk-through mode", page 136.



3. If the O_2 sensor is to be calibrated despite a valid calibration, touch the ***Calibrate*** button (3).

4. **⚠ CAUTION**
   Risk of device malfunction and/or patient injury
   Existing malfunctions cannot be detected if the system test is canceled. This may result in device malfunctions and the patient may be put at risk.
   ► More attention is required when operating without a system test.
   ► Perform the system test every day. If the system test is canceled during execution, perform it again as soon as possible.

If all components are operational, touch the ✓ button (4). The automatic test will start.
If a component is not operational, touch the ✕ button (5).
The walk-through mode will start.

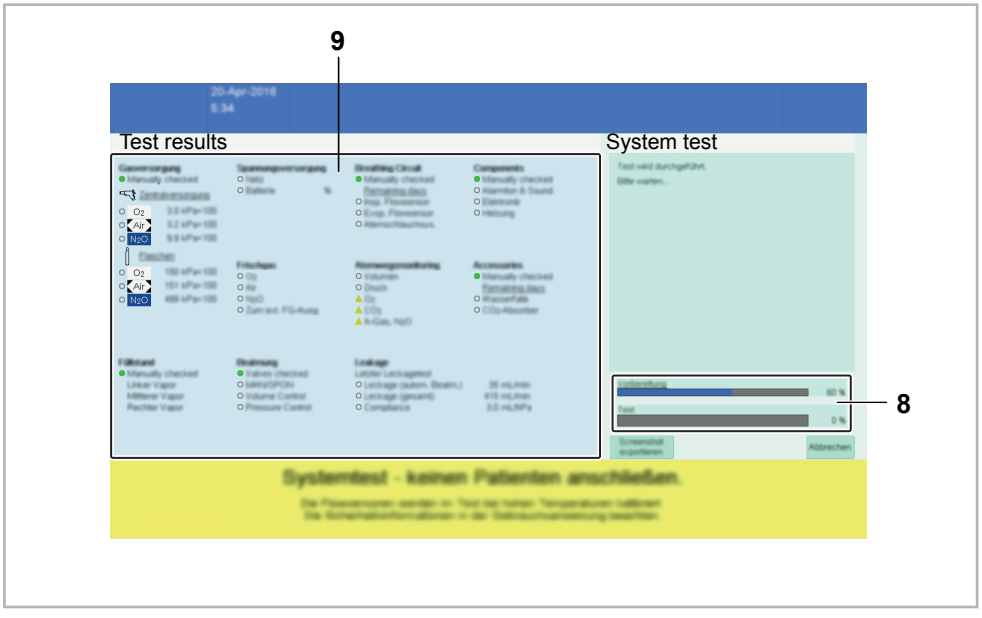


The components (6) are polled one after the other.

The buttons (7) are used to document whether the check passed.

Button	Meaning
✓	Check passed
✕	Check failed

The automatic test starts after all the checks in the walk-through mode are complete.



The test progress is displayed in area (8) while the automatic test is running. All test results are displayed in area (9).

After the test, the final test result is displayed on the standby screen, see page 87.

8.3.1.1 Test interruption due to irregularities

If an irregularity is detected during the automatic test, the following occurs:

– The test is interrupted.
– An acoustic signal sounds. This signal is repeated every 15 seconds.
– Information on the cause and remedy are displayed.

Remedying the cause:

1. Remedy the cause of the interruption.
2. Touch the ***Repeat*** button (1) and repeat the test of the component.

Accepting the irregularity:

► Touch the ***Accept*** button (2) and continue the test.

Accepted irregularities prevent the total result of the system test from indicating "fully operational" and are protocoled in the logbook.

8.3.2 Manual check for leakage

8.3.2.1 Checking a vaporizer for leakage

The leakage of a vaporizer can be determined with 2 tests:

– Quick tightness check: Checks whether there is leakage.
– Complete leakage test: Determines the leakage value.

Prerequisites:

– The leakage test of the device has been performed and passed.
– The vaporizer is mounted directly and securely on the plug-in adapter.
– The filling inlet is closed.
– The vaporizer is closed. The control dial is in the ***0*** position.
– The breathing circuit is correctly connected.
– The APL valve is set to 30.
– The Y-piece is sealed.

– Gas mixer:
  – With electronically controlled gas mixer:
    The flow control valve of the O_2 flowmeter is closed.
  – With mechanically controlled gas mixer:
    All flow control valves are closed.

Quick tightness check

1. Touch the ***Tests...*** button.
2. Touch the ***System test*** button.
   The checklist opens and the breathing system pressure is displayed as a bar graph in the lower left-hand corner.
3. Press the ***O_2+*** key and keep it pressed until the displayed breathing system pressure no longer rises.
4. Release the ***O_2+*** key.
5. Wait until the pressure stabilizes between 15 and 30 hPa.
   – When the pressure has stabilized, continue with the check, see step 6.
   – If the pressure continues to fall, there is a leakage present. Decide whether to end the check or continue with it.
6. Set the vaporizer to the smallest delivery setting. To do this, turn the control dial from the ***0*** position to the first mark on the scale.
7. Observe the breathing system pressure. The pressure must remain stable and may only drop at a minimally slow rate.
   If the pressure drops faster, the vaporizer is leaking.
8. Close the vaporizer. To do this, set the control dial to the ***0*** position.
9. Exit the System test again. To do this, touch the ***Cancel*** button.

For leaky vaporizers, the compete leakage test can be used to determine how large the leakage is.

Complete leakage test

Testing the vaporizer in the closed state:

1. Touch the ***Tests...*** button.
2. Touch the ***Leakage test*** button.
3. Perform the leakage test with the vaporizer closed.
   If no leakage value is displayed, the test has passed. If the determined leakage is at least 500 mL, the leakage value ***Leakage (total)*** is displayed.

Testing the vaporizer in the open state:

1. Touch the ***Tests...*** button.
2. Touch the ***Leakage test*** button.
3. Set the vaporizer to the smallest delivery setting. To do this, turn the control dial from the ***0*** position to the first mark on the scale.
4. Perform the leakage test with the vaporizer opened.
   If no leakage value is displayed, the test has passed. If the determined leakage is at least 500 mL, the leakage value ***Leakage (total)*** is displayed.
5. Close the vaporizer. To do this, set the control dial to the ***0*** position.

6. Press the ***O2+*** key and keep it pressed for at least 5 seconds. The breathing system will be flushed and the residual anesthetic agent will be disposed of in the AGS.

Using the determined values, the user can decide whether the vaporizer can be used.

8.3.2.2 Checking a coaxial breathing circuit

Leakage in the inner hoses of coaxial breathing circuits cannot be detected with the normal system test. A special test adapter is used to determine the leakage in Dräger coaxial breathing circuits. The following checks are possible:

– Quick tightness check: Checks whether there is leakage.
– Complete leakage test: Determines the leakage value.

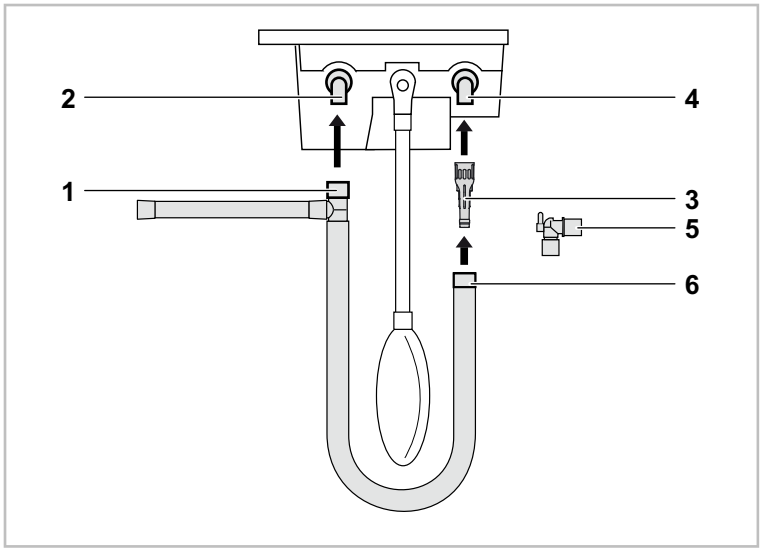
For both checks, first the inner inspiratory hose and then the outer expiratory hose is tested.

Prerequisites:

– The vaporizers are closed. The control dial is in the ***0*** position.
– The APL valve is set to 30.
– Gas mixer:
  – With electronically controlled gas mixer:
    The flow control valve of the O_2 flowmeter is closed.
  – With mechanically controlled gas mixer:
    All flow control valves are closed.

Quick tightness check

Checking the inner hose:



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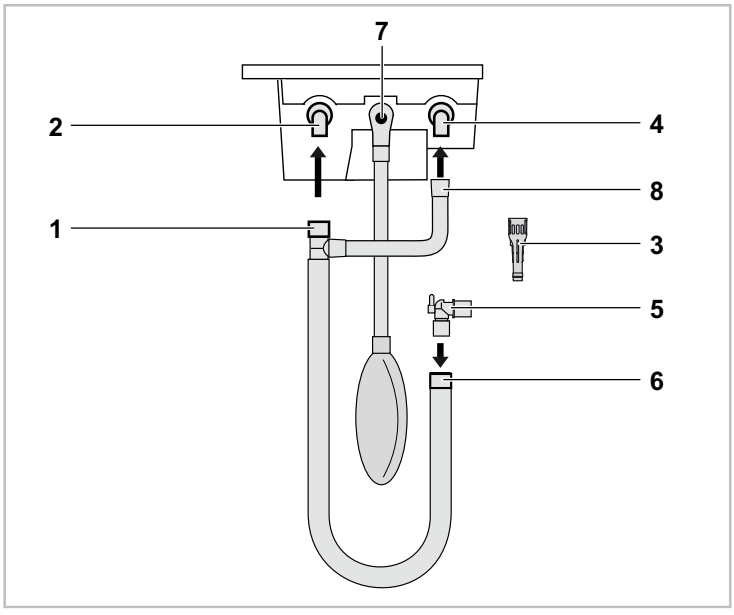
1. Connect the breathing circuit as follows:
   a. Connect the hose (1) to the inspiratory port (2).
   b. Connect the coaxial test adapter (3) to the expiratory port (4).
   c. Remove the elbow (5) from the hose (6).

d. Connect the hose (6) to the coaxial test adapter (3).

2. Touch the ***Tests...*** button.
3. Touch the ***System test*** button.
   The checklist opens and the breathing system pressure is displayed in the lower left-hand corner.
4. Press the ***O2+*** key and keep it pressed until the displayed breathing system pressure no longer rises.
5. Release the ***O2+*** key.
6. Wait until the pressure stabilizes between 15 and 30 hPa. If the pressure drops further, the hose is leaking.

Checking the outer hose:



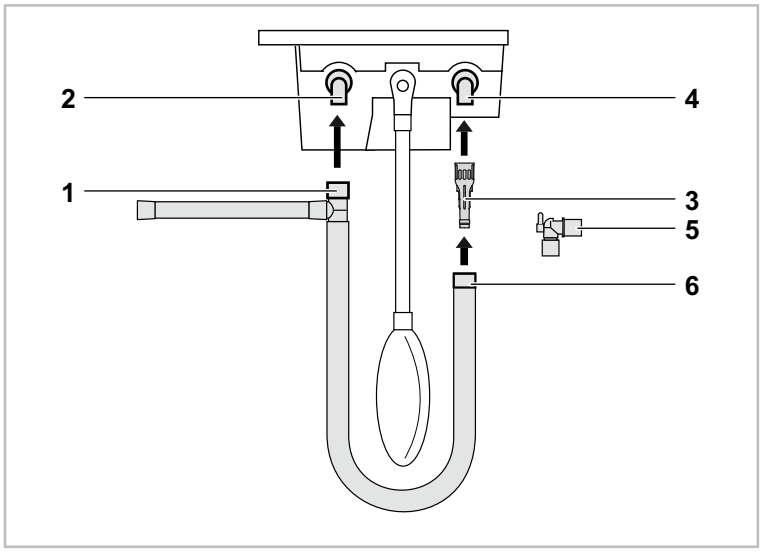
39555

1. Connect the breathing circuit as follows:
   a. Connect the hose (1) to the inspiratory port (2).
   b. Remove the coaxial test adapter (3) from the expiratory port (4).
   c. Connect the elbow (5) to the hose (6).
   d. Plug the hose (6) with the elbow connected on to the circuit plug (7).
   e. Connect the hose (8) to the expiratory port (4).
2. Touch the ***Tests...*** button.
3. Touch the ***System test*** button.
   The checklist opens and the breathing system pressure is displayed in the lower left-hand corner.
4. Press the ***O2+*** key and keep it pressed until the displayed breathing system pressure no longer rises.
5. Release the ***O2+*** key.
6. Wait until the pressure stabilizes between 15 and 30 hPa. If the pressure drops further, the hose is leaking.
7. Exit the system test again. To do this, touch the ***Cancel*** button.

For leaking hoses, the complete leakage test can be used to determine how large the leakage value is and whether the hose can continue to be used.

Complete leakage test

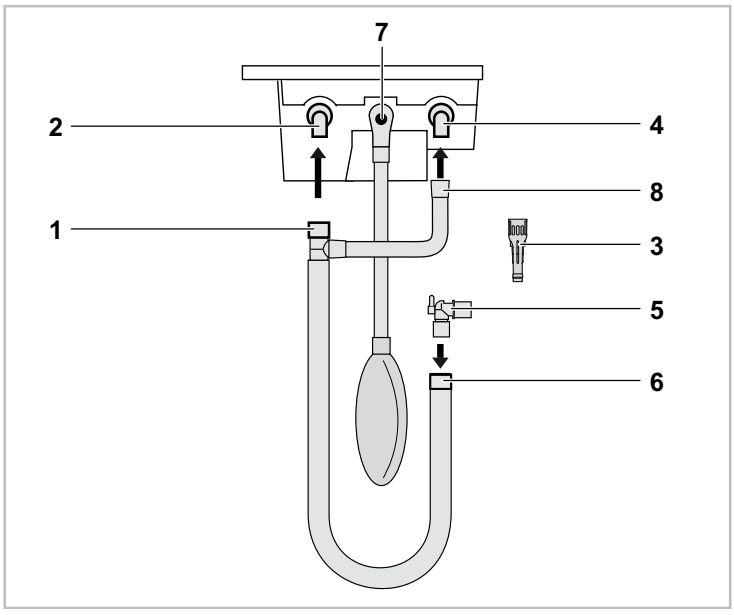
Testing the inner hose:



1. Connect the breathing circuit as follows:
   a. Connect the hose (1) to the inspiratory port (2).
   b. Connect the coaxial test adapter (3) to the expiratory port (4).
   c. Remove the elbow (5) from the hose (6).
   d. Connect the hose (6) to the coaxial test adapter (3).
2. Touch the ***Tests...*** button.
3. Touch the ***Leakage test*** button.

The value determined for leakage is displayed as ***Leakage (mech. vent.)***. Note down the value as the leakage of the inspiratory hose.

Testing the outer hose:



1. Connect the breathing circuit as follows:
   a. Connect the hose (1) to the inspiratory port (2).
   b. Remove the coaxial test adapter (3) from the expiratory port (4).
   c. Connect the elbow (5) to the hose (6).
   d. Plug the hose (6) with the elbow connected on to the circuit plug (7).
   e. Connect the hose (8) to the expiratory port (4).
2. Touch the ***Tests...*** button.
3. Touch the ***Leakage test*** button.

The value determined for leakage is displayed as ***Leakage (mech. vent.)***. Note down the value as the leakage of the expiratory hose.

Evaluation of the values determined for leakage:

Test of the inspiratory hose	Test of the expiratory hose	Evaluation
≤150 mL	≤150 mL	The breathing circuit is intact.
>150 to <500 mL	≤150 mL	Low leakage. Check whether the breathing circuit is suitable for the particular patient category.
>500 mL	≤150 mL	Do not use the breathing circuit. There is a risk of rebreathing.
≤150 mL	>150 to <500 mL	Take account of the leakage when setting the parameters for fresh gas and ventilation.
≤150 mL	>500 mL	Do not use the breathing circuit.
>150 mL	>150 mL	The leakage is possibly caused by other components and not by the breathing circuit. Repeat the test with a different coaxial breathing circuit.

8.4 Checklist in the walk-through mode

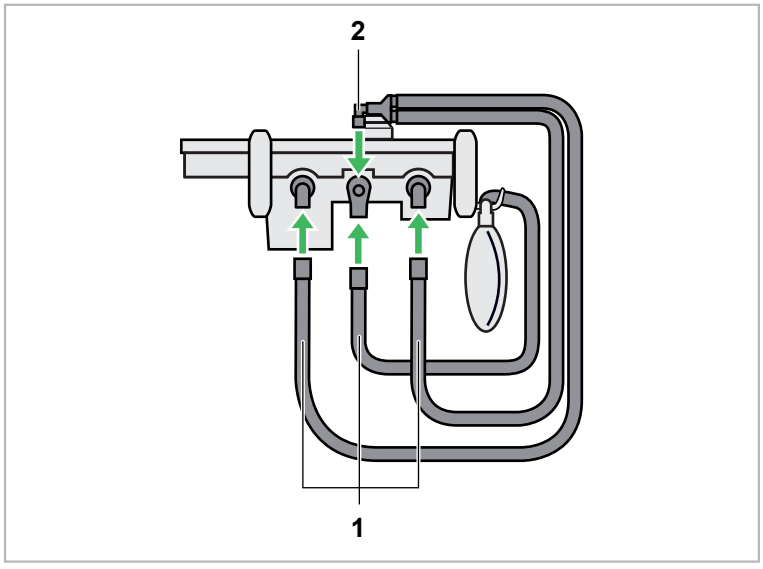
This section describes how the checklist is processed, using as an example a device with an electronically controlled gas mixer, active AGS, O_2 sensor, and factory defaults.

The scope of the checklist and the test steps displayed may vary due to differing system settings.

The instructions on the screen take precedence.

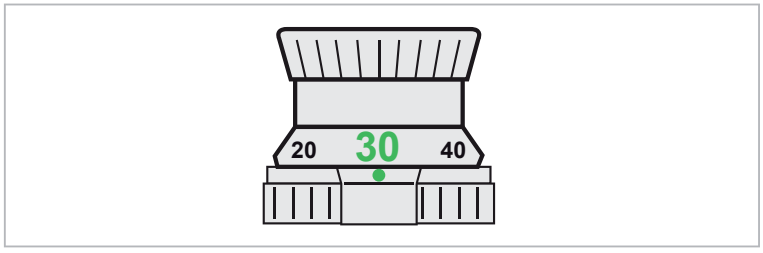
Prerequisites

1. Connect the hoses (1).
2. Seal the Y-piece (2).



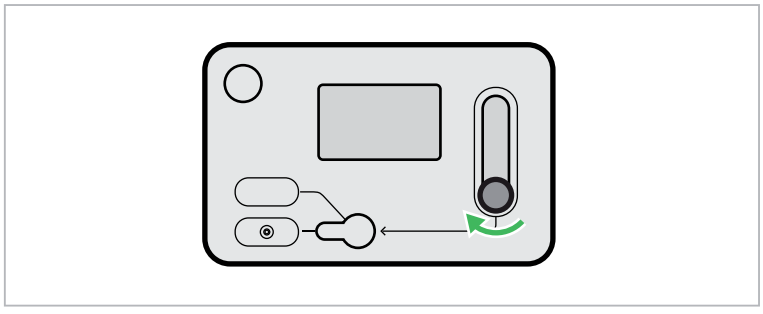
35102

3. Set the APL valve to 30.

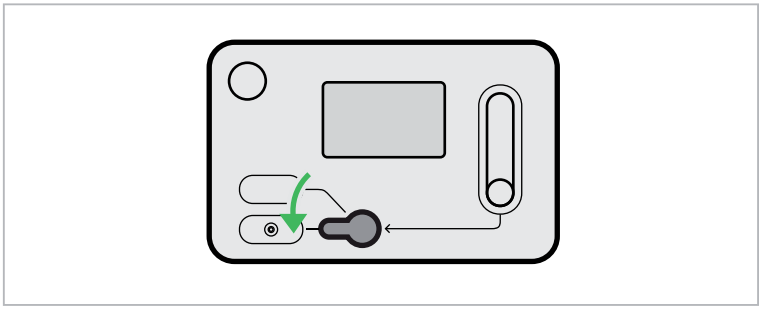


35100

4. Close the flow control valve.


35103

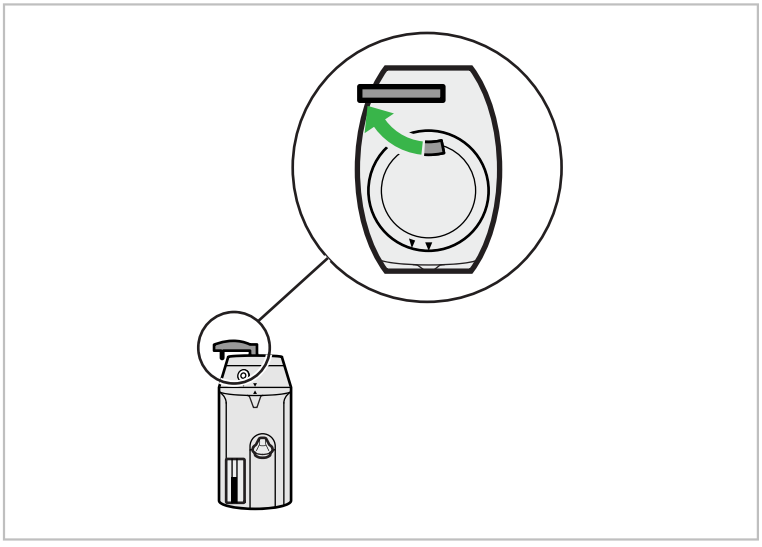
5. Set the O_2 switch to ***Aux. O_2***.



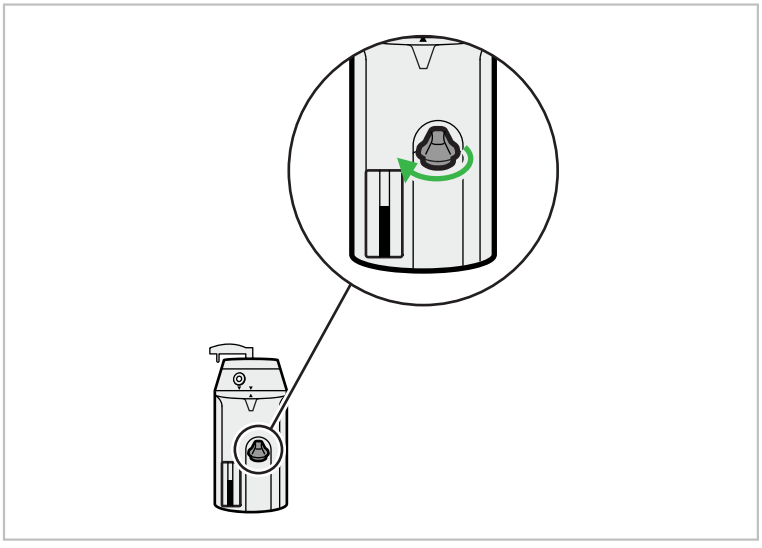
8.4.1 Vaporizers

For each vaporizer, check:

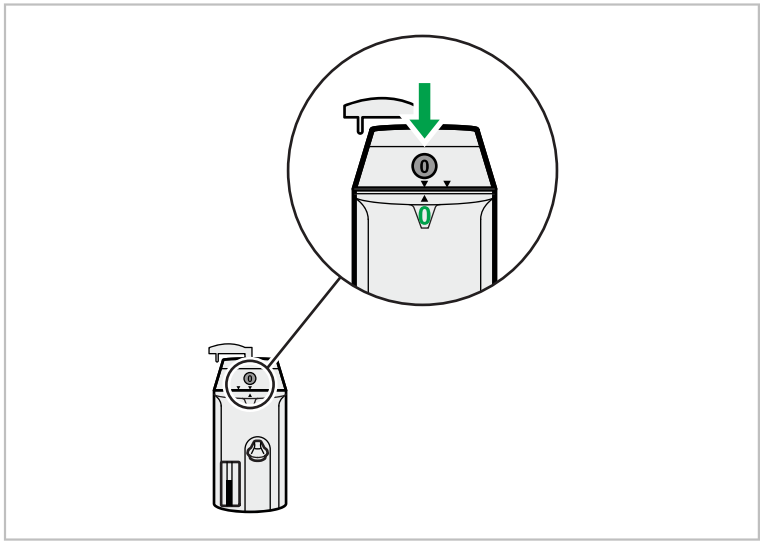
1. The locking lever points left, indicating the vaporizer is locked.



2. The filling inlet is closed.

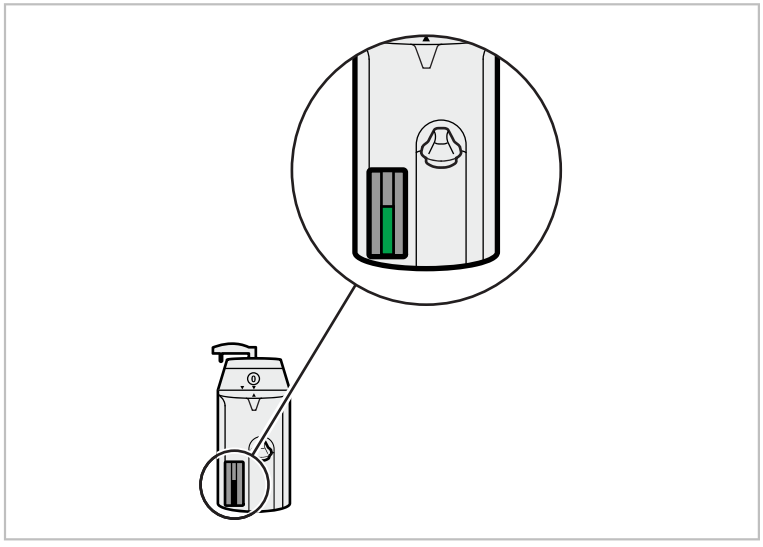


3. The control dial is set to position ***0*** and the key is locked in placed.



35107

4. Check the filling level in the sight glass. Refill anesthetic agent if required.

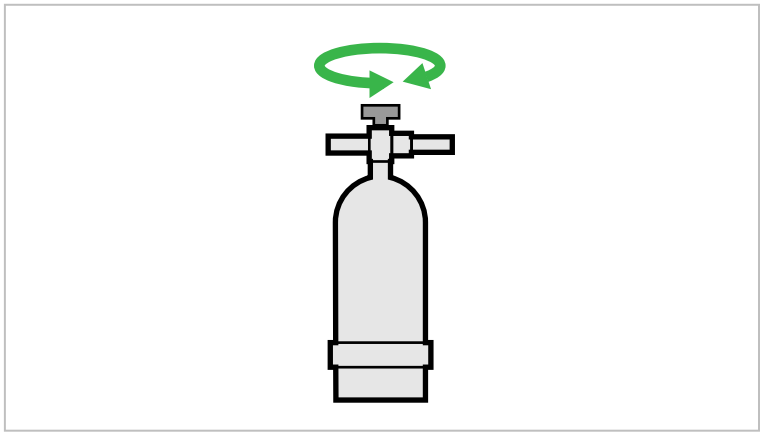


35106

8.4.2 Gas flow

8.4.2.1 Gas cylinders

1. Open the gas cylinder valves slowly.
   Check that the displayed pressures are sufficient.

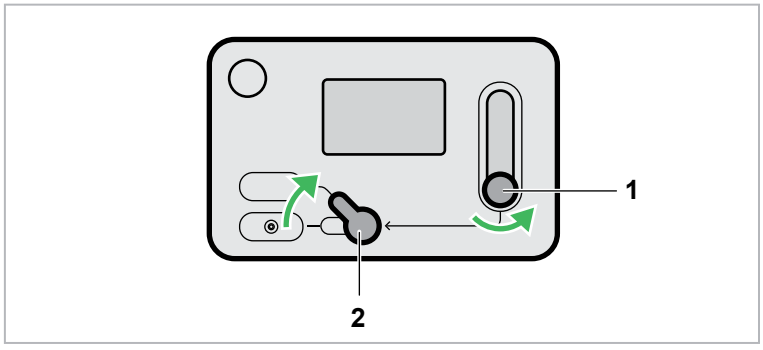

35109

   When using pressure reducers without electronic pressure measurement, read the pressure from the pressure gauge.
2. Close the gas cylinder valves.
   On devices that are equipped with Advanced Cylinder Support, the gas cylinder valves can remain open during operation. These devices are identified by an appropriate label near the gas inlets (see "Gas inlets", page 26).

8.4.2.2 Checking the emergency O_2 delivery (with electronically controlled gas mixer)

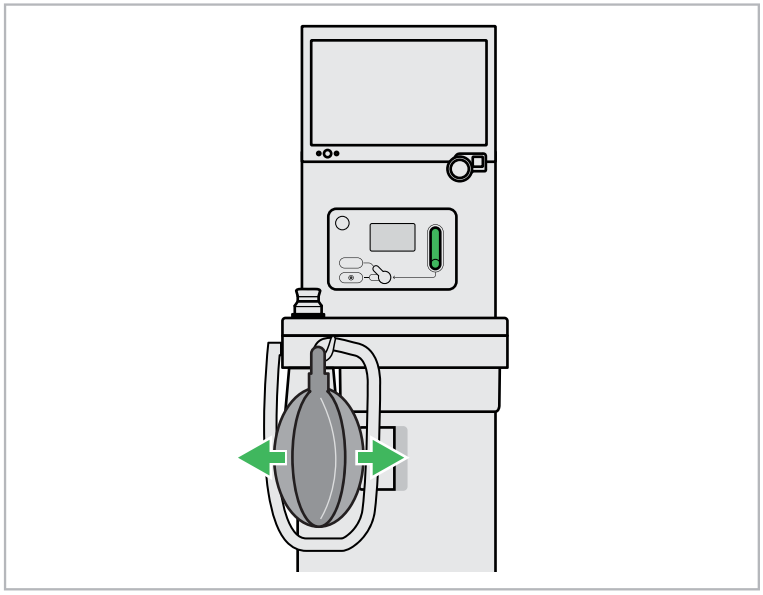
Prerequisite: Y-piece is sealed.

1. Set the O_2 switch (2) to the ***Add. O_2*** position.



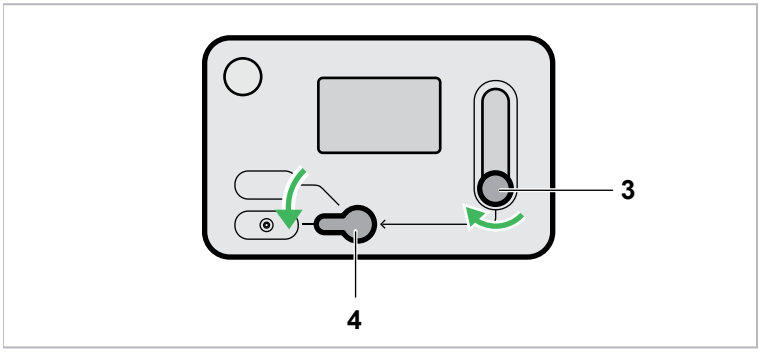
35110

2. Open the flow control valve (1). Set the desired O2 flow.



The O2 flowmeter indicates a flow, the breathing bag fills, and the inflow of gas is audible.

3. Close the flow control valve (3).



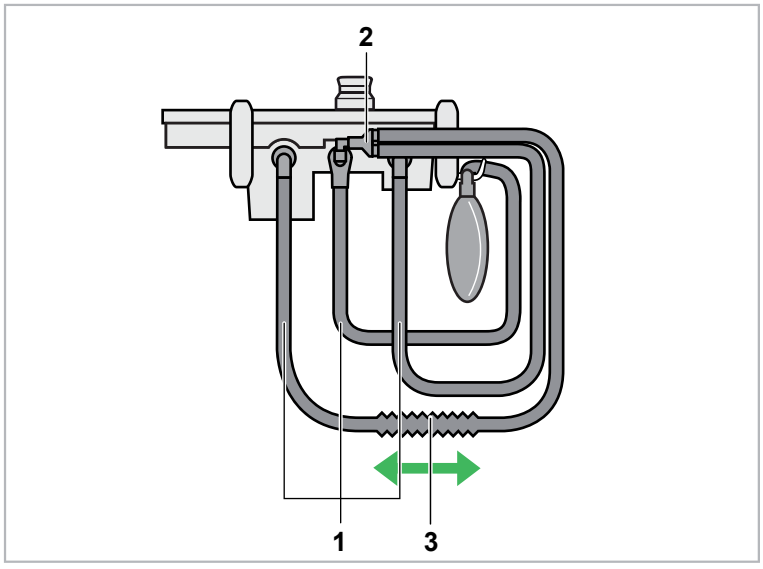
4. Set the O2 switch (4) back to the ***Aux. O2*** position.

8.4.3 Breathing circuit

Prerequisite:

– Breathing system is complete and locked.
– Breathing system cover is fitted.

1. Hoses (1) and filters, e.g., at the Y-piece (2), are connected properly.

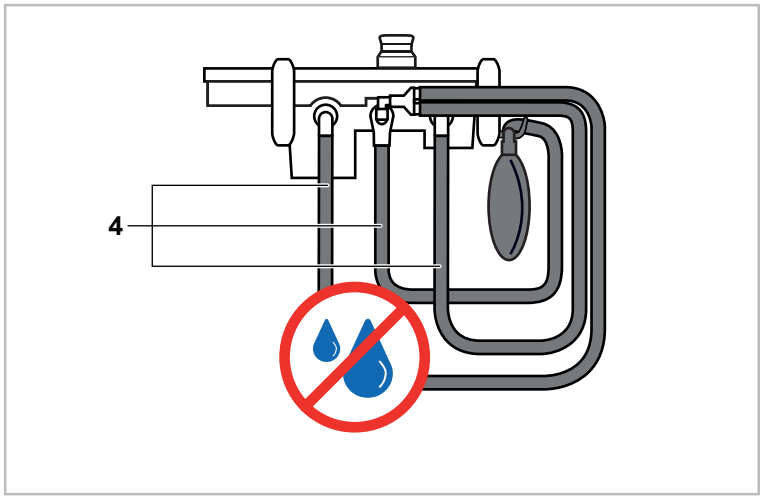


35115

2. Extendable hoses (3) are extended to the length intended for use.

ℹ Do not change the length of the hoses after the test is done.

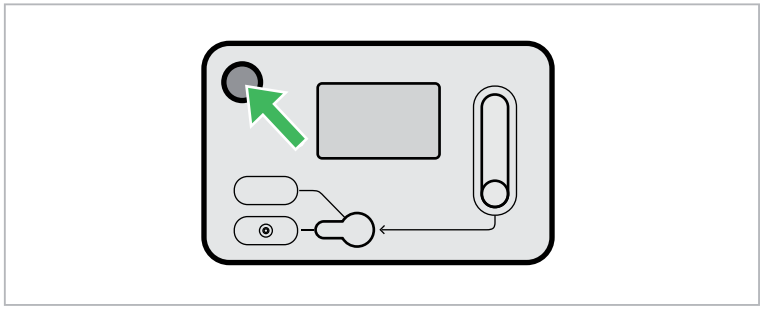
3. Remove the water from the hoses (4).



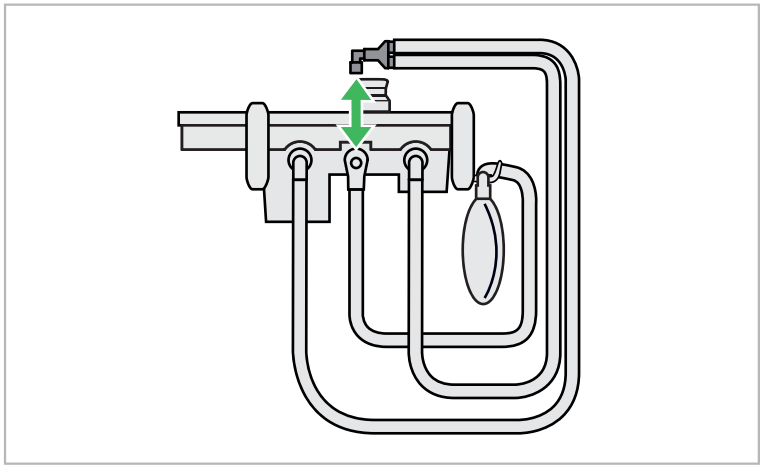
35117

4. Prerequisite:
   – Patient-gas measurement module present
   – Setting: Sample line is connected during test: Off
   – Setting: Test breathing circuit: On
   – Electronically controlled gas mixer or mechanically controlled gas mixer with O_2 detection

Press the ***O2+*** key. The inflow of gas is audible. Keep the key pressed until the pressure exceeds 15 hPa (cmH2O).



5. Pull off the Y-piece and plug it on again. The pressure drops.



8.4.3.1 Special test settings

1. Test breathing circuit
   Prerequisite:
   - Patient-gas measurement module present
   - Sample line is connected during test: On
   - Electronically controlled gas mixer or mechanically controlled gas mixer with O2 detection

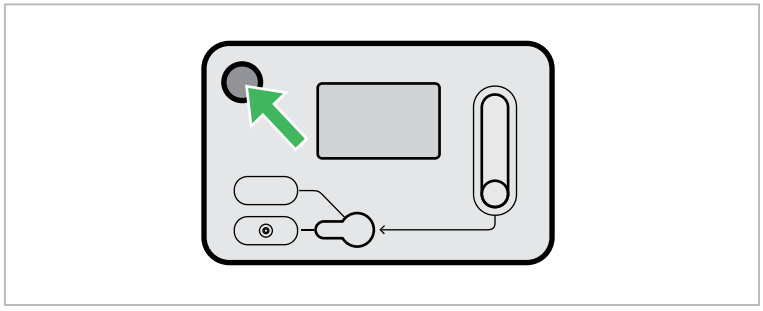
   A check is made to ensure that the inspiratory hose, expiratory hose, and breathing bag hose are connected correctly.
   This can be deactivated in the System setup > System > System test dialog.
2. Verify O2 delivery
   Prerequisite:
   - Patient-gas measurement module present
   - Sample line is connected during test: On
   - Electronically controlled gas mixer or mechanically controlled gas mixer with O2 detection

   A check is made to ensure that the O2 supply is actually delivering O2. This is checked at the Y-piece, using the connected sample line.

8.4.4 Valves

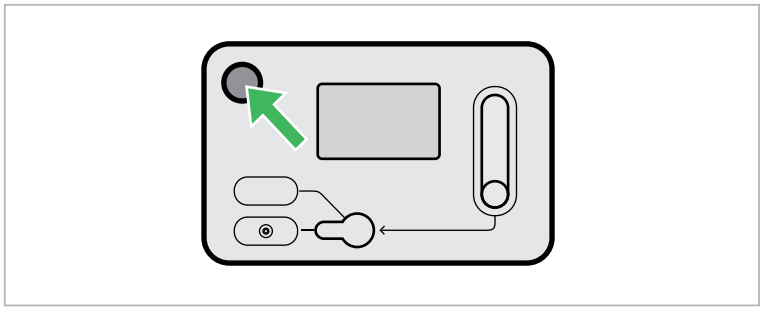
8.4.4.1 Checking the O_2 flush

1. Press the ***O2+*** key and keep it pressed until the pressure stabilizes.



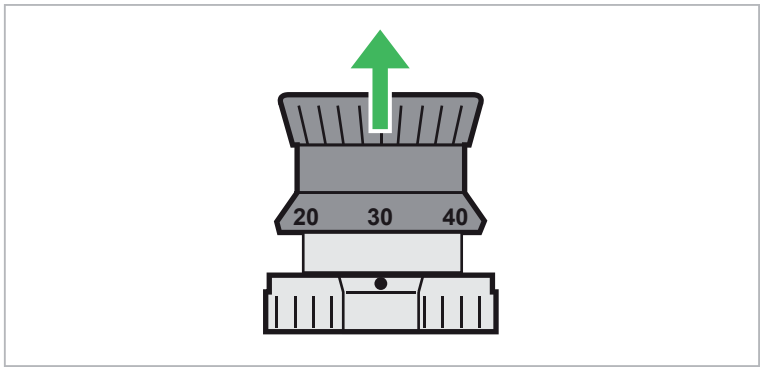
The pressure does not exceed 45 hPa (cmH_2O).

2. Release the ***O2+*** key again and wait until the pressure stabilizes.



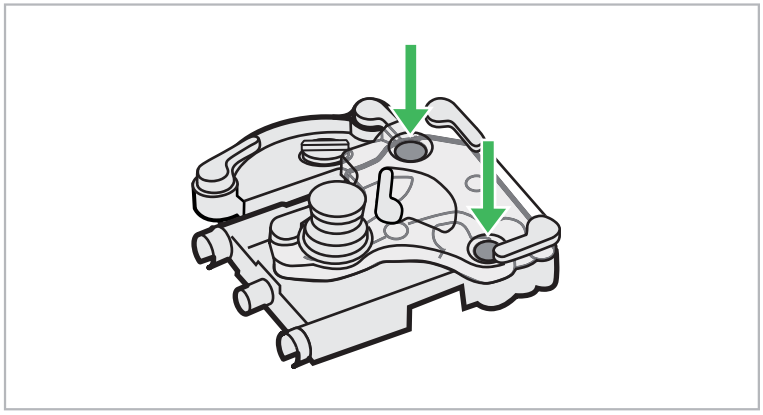
The pressure does not fall below 15 hPa (cmH_2O).

3. Lift the APL valve.



The pressure is released.

4. Remove the breathing system cover.

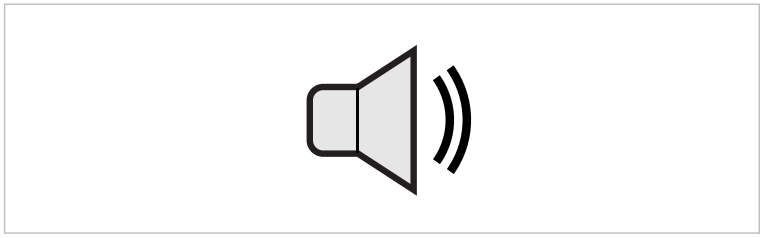


The non-return valves have been fitted.

8.4.5 Components

8.4.5.1 Loudspeakers

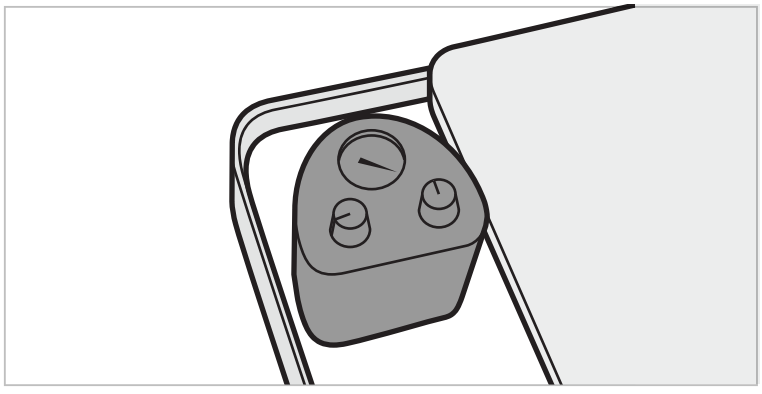
► Touch the button and wait for 2 different acoustic signals.



ℹ If the acoustic signals are not emitted, contact service personnel.

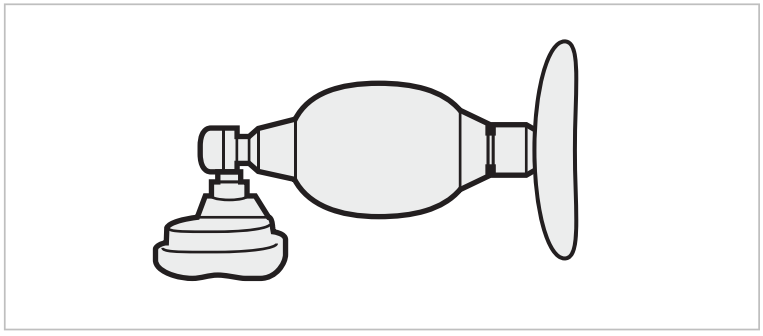
8.4.5.2 Bronchial suction

► Check the functional integrity of the bronchial suction.



8.4.5.3 Manual resuscitator

1. Make sure there is a manual resuscitator on the device.

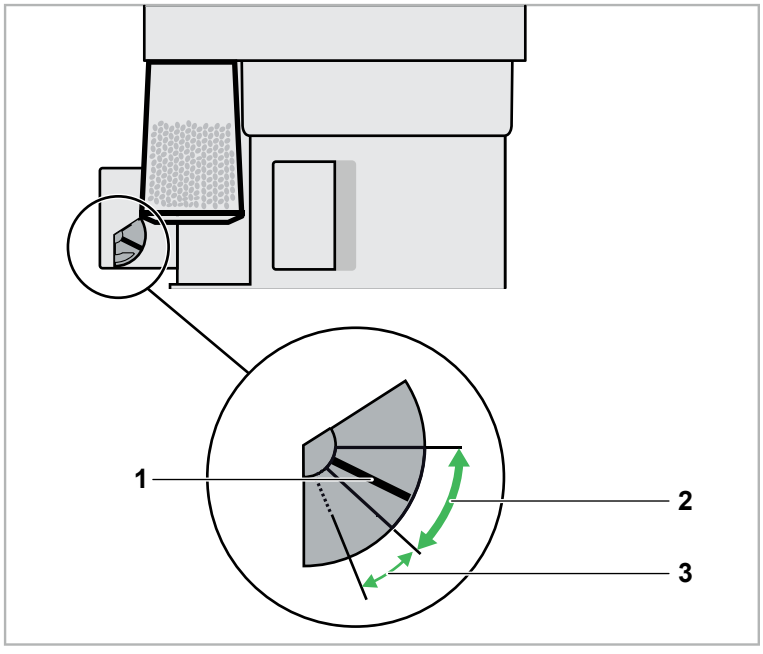


2. Check the functional integrity of the manual resuscitator.

8.4.5.4 Anesthetic gas receiving system

With active anesthetic gas scavenging:

► Have the flow for the anesthetic gas scavenging system set so that the red flow indicator (1) floats in range (2) ("normal range").

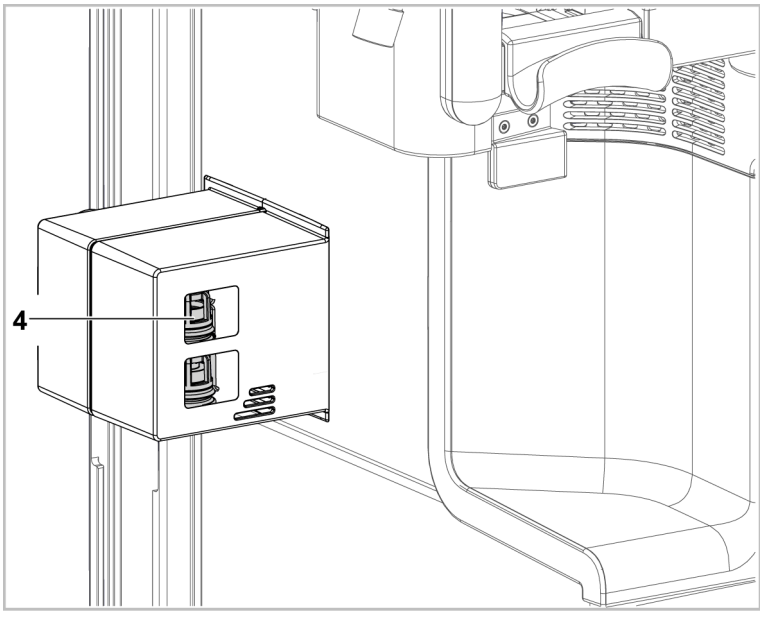


If the flow indicator (1) is floating in range (3) ("restricted range"), certain fresh-gas flows should not be exceeded, see "Anesthetic gas receiving system" in chapter "Technical data". Contamination of the ambient air can be prevented by limiting the fresh-gas flow.

For passive anesthetic gas scavenging:

1. **⚠ WARNING**
   Risk of overpressure
   If the overpressure valve in the passive AGS or the scavenging hose is blocked, overpressure in the breathing circuit and in the patient's lungs will occur.
   ► Take care that the scavenging hose does not become blocked.
   ► Perform a visual inspection of the overpressure valve for damage and soiling.

   Check that the scavenging hose is run correctly. The hose must not be blocked.
2. Perform the visual inspection of the overpressure valve (4).

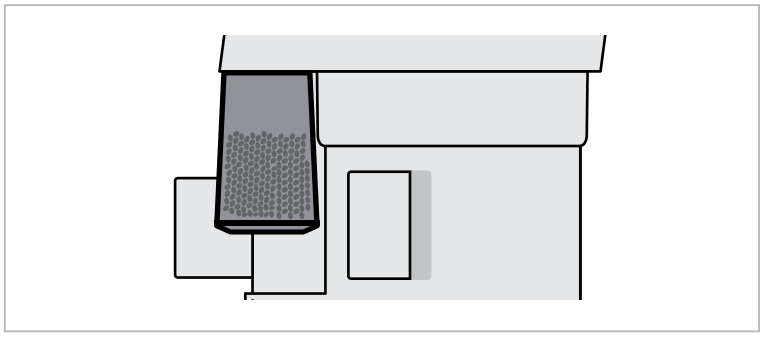


42190

8.4.6 Accessories

8.4.6.1 Soda lime

► Make sure that the soda lime does not need to be exchanged. Change the soda lime if it is discolored or when its maximum period of use has been reached, see page 75.


35128

With Infinity ID function:

– Absorbers of type Infinity ID CLIC Absorber will be detected automatically. The replacement date will be set automatically.

Without Infinity ID function:

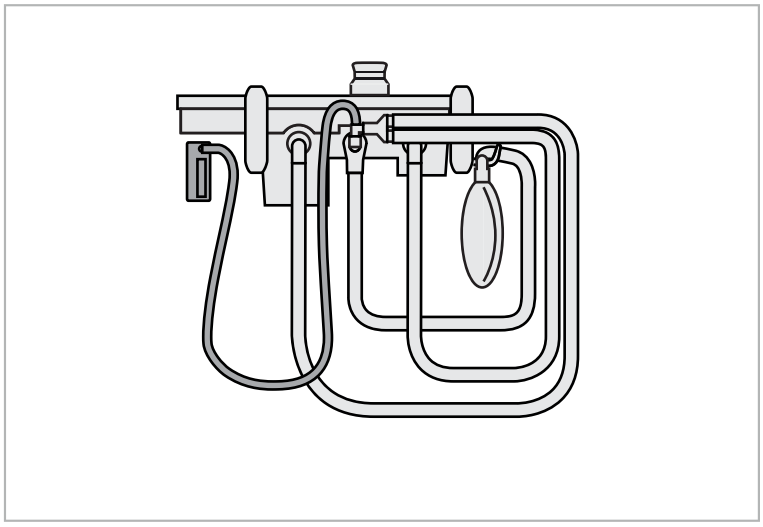
– Absorbers will not be detected, e.g., reusable CO_2 absorbers.

► Update the replacement date manually: Touch the ***Reset*** button after the soda lime has been replaced.

ℹ Only perform leakage tests with the CLIC absorber locked into place because the CLIC absorber affects the system compliance values.

8.4.6.2 Sample line

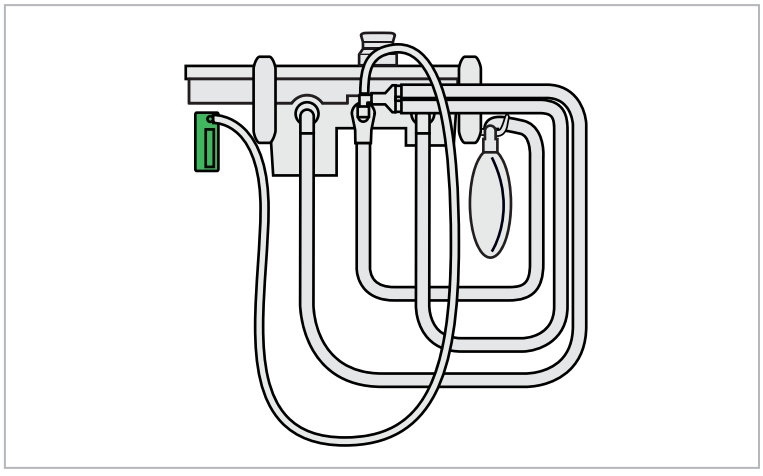
► Check that the sample line is correctly connected.



35129

8.4.6.3 Water trap

1. Check the water level in the water trap.



35130

2. Check the period of use of the water trap. Replace the water trap when necessary.

   With Infinity ID function:

   – Water traps of type Infinity ID WaterLock 2 will automatically be detected and the replacement date will automatically be set.

Without Infinity ID function:

– Water traps will not be detected.

► Update the replacement date manually: Touch the ***Reset*** button after a new water trap has been installed.

8.4.6.4 Calibrating the inspiratory O_2 sensor

⚠ CAUTION

Risk of inaccurate measured values

During calibration, the sensor must be exposed to ambient air, i.e., 21 % oxygen concentration. Fluctuating oxygen concentrations must be avoided. The following notes must be adhered to:

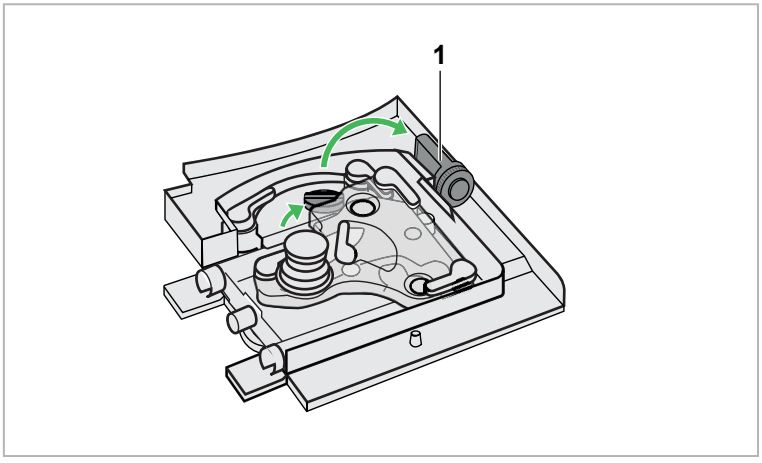
► Do not fill vaporizers during the calibration.

► Close all the flow control valves.

► Do not blow into the sensor.

► Do not use any disinfectants.

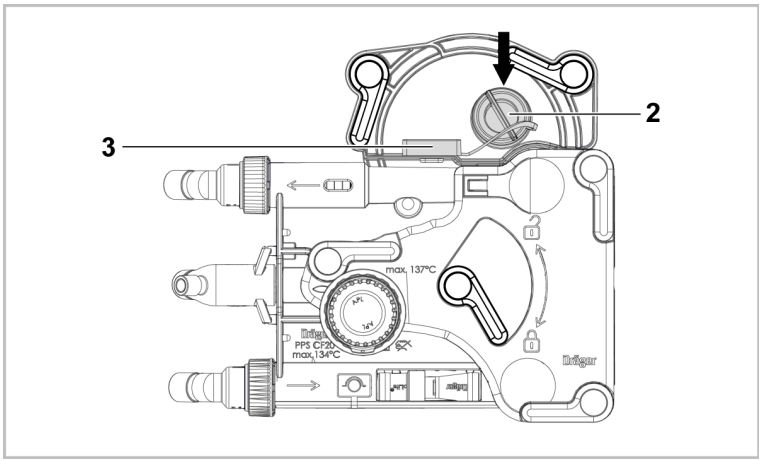
1. If the O_2 sensor is to be calibrated despite a valid calibration, proceed as follows.
   Touch the ***Calibrate*** button.
2. Touch the ✓ button and follow the instructions on the screen.
3. Turn the O_2 sensor counterclockwise and remove it.
   Place the O_2 sensor as shown (1).



39679

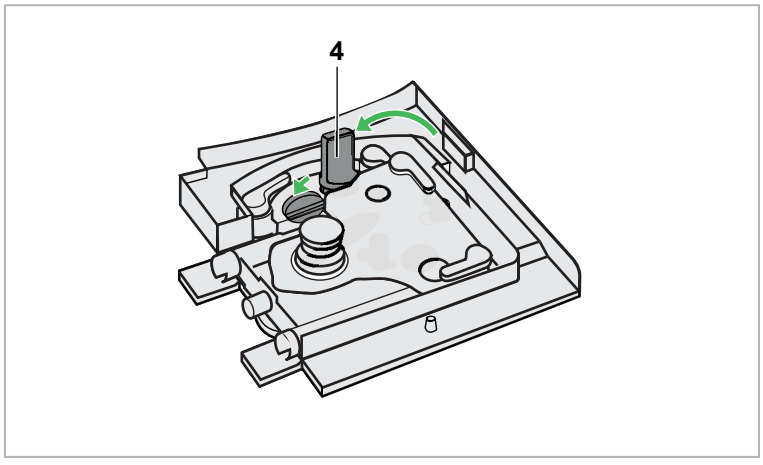
4. Take the sealing cap (2) from the holder (3).

Seal the sensor port with the sealing cap.



39674

5. Follow the instructions on the screen.
   The device will perform the calibration.
6. After the calibration is complete, remove the sealing cap and plug it back in the holder.
   Insert the O_2 sensor (4) back into the sensor port and turn it clockwise until it reaches the end position.

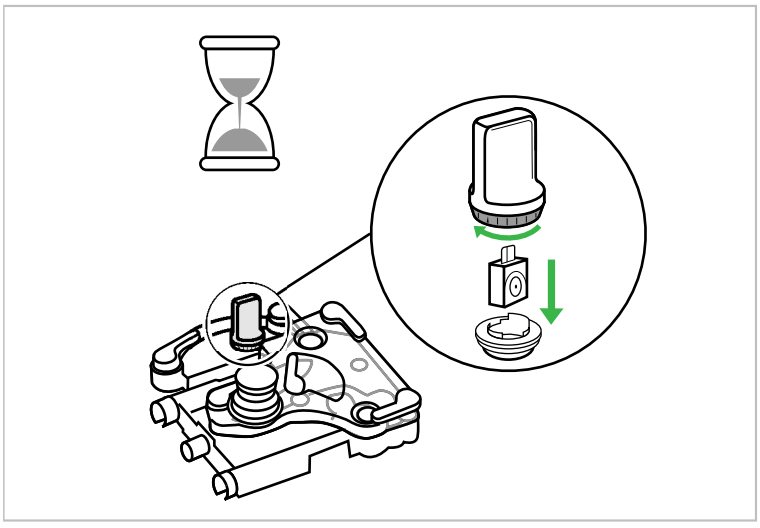


39680

7. After the calibration, the fully automatic main test is continued.

Note on the expiry of the life span of the O_2 sensor cell

The life span of the O_2 sensor cell is 2 years and is monitored by the device. As soon as there are 28 days or fewer of the life span left, the remaining life span will be displayed in the system test. When the life span has expired, a corresponding message and the following illustration will be displayed:



If the O_2 calibration is possible despite the expired O_2 sensor cell, the O_2 measurement will continue to be available. With an expired O_2 sensor cell, a yellow test result (operational with limitations) can be achieved at best.

Replace the sensor cell when the O_2 sensor can no longer be calibrated, see page 55.

9 Ending operation

9.1 At the end of the OR day

Dräger recommends shutting down the device during longer periods of non-use such as overnight or on weekends. This can lower power consumption and prolong the life span of the medical device without negatively influencing device availability.

1. Make sure that all flow control valves are closed.
2. Press the ⏻ key.
3. Follow the instructions on the screen.

9.2 Storing the device

Proceed as follows when the device is to be disconnected from the mains power supply for longer than 2 weeks:

1. Set the main switch to the ***0*** position.
2. Disconnect the power plug. This will prevent deep discharge of the battery.

9.3 Disconnecting the mains power supply

When the device is disconnected from the mains power supply, the internal battery takes over the function of supplying power. The status display remains active. Follow the instructions for storing the device.

► Disconnect the power plug.

10 Alarms

10.1 Safety instructions

Alarm volume

If the alarm volume is too low, alarm signals may not be heard. The patient may be put at risk.

► Set the alarm volume loud enough so that the alarm signals can be heard in the environment where the device is located.

► The user must remain within earshot of the alarm signals.

Recognizing alarm signals

If alarm signals are not noticed, the patient may be put at risk.

► Dräger recommends that the user remains in the vicinity of the anesthesia machine, i.e. within a distance of up to 4 meters (12 feet). This facilitates fast recognition and response in the event of an alarm.

► If the causes of the alarm are only temporary, the alarms will likewise only be indicated temporarily.

Impaired Infinity ID functions

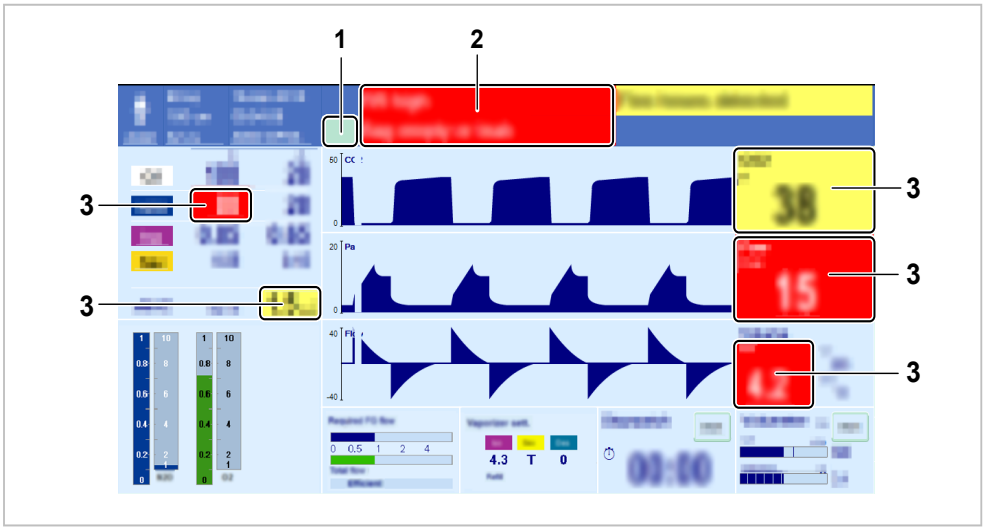
Electromagnetic disturbances or faults in Infinity ID components can cause permanent alarms.

► Contact service personnel to deactivate the Infinity ID alarms.

10.2 Displaying alarms

Alarms are signaled optically and acoustically during the therapy. In standby mode, alarms are signaled optically. However, if the user must respond to certain alarms in standby mode, these alarms will also be signaled acoustically.

10.2.1 Optical alarm signals



No.	Designation
1	***All alarms*** button
2	Alarm message field
3	Alarm-triggering parameters

In the event of an alarm, the device displays the relevant alarm message in the alarm message field. For certain alarms, the parameter field of the parameter triggering the alarm will flash.

In the alarm message field (2), up to 8 alarms can be displayed at a time. If more alarms occur, the ***All alarms*** button (1) is displayed. Touching this button opens the ***Alarms*** > ***Current alarms*** dialog with information about all active alarms, see page 154.

10.2.2 Acoustic alarm signals

It always is the alarm with the highest priority that is acoustically signaled. The signal is emitted until either the cause of the alarm is remedied or the alarm silence key is pressed.

In situations where several alarms occur at the same time, alarms with higher priority may only be signaled with a 5-tone sequence instead of a 10-tone sequence.

Regardless of the set alarm volume, the ***No O_2 delivery*** alarm is issued at maximum volume.

10.2.3 Alarm priorities

The device assigns the appropriate priority to each alarm message.

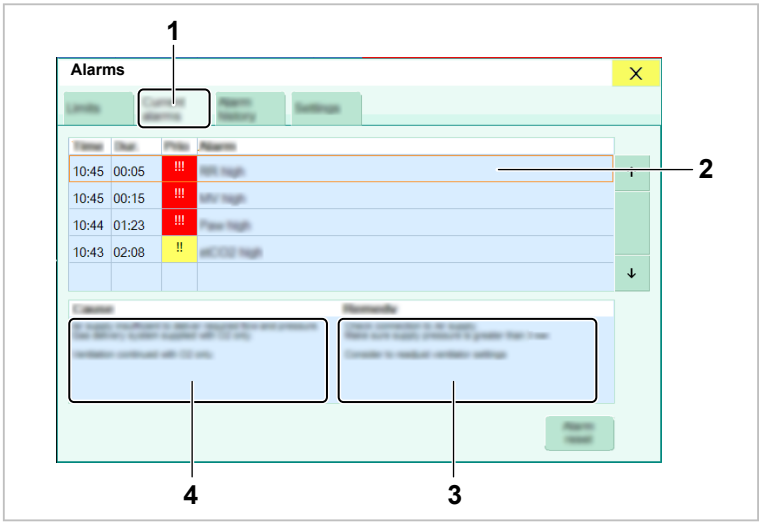
The background color of the alarm message field indicates the alarm priority of the active alarms. The parameter field of the parameter triggering the alarm flashes in the color matching the alarm priority.

Background color	Alarm priority	Label	Meaning
Red	High	!!!	Immediate action is necessary in order to avert imminent danger.
Yellow	Medium	!!	Prompt action is necessary in order to avert a danger.
Cyan	Low	!	Attention is necessary, but a delayed response is sufficient.

10.3 Response to alarms

10.3.1 Displaying information on alarms

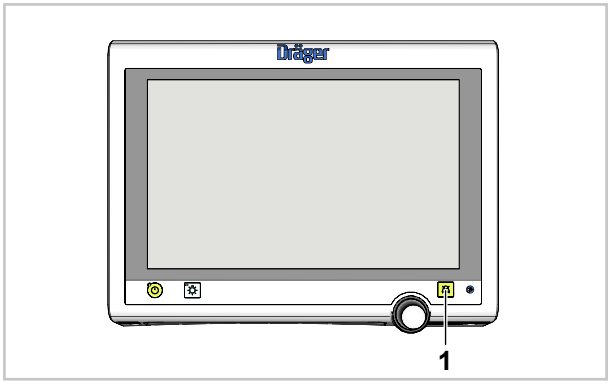
1. Information on the alarms can optionally be displayed as follows:
   – Touch the alarm in the header bar.
   – Open the ***Alarms*** dialog and touch the ***Current alarms*** tab (1).



2. In the list (2), touch the corresponding alarm or select it with the rotary knob.
3. Refer to the information under ***Cause*** (4) and ***Remedy*** (3) to remedy the error. A list of all possible alarms can be found in chapter "Alarm – Cause – Remedy", see page 201.

10.3.2 Silencing the alarm tone

The alarm tone can be silenced for a maximum of 2 minutes.



► Press the alarm silence key 🔕 (1) below the screen, see page 17.

The 🔕 symbol and the remaining time for the silenced alarm tone are displayed in the header bar.

If the cause of the alarm persists, the alarm tone starts again immediately after the alarm silence ends.

During the alarm silence, only new alarms with a higher alarm priority or a higher internal priority number compared with the silenced alarm are acoustically signaled. For further information see: "Alarm – Cause – Remedy", page 201.

10.3.2.1 Reactivating the alarm tone

► Press the alarm silence key 🔕 again.

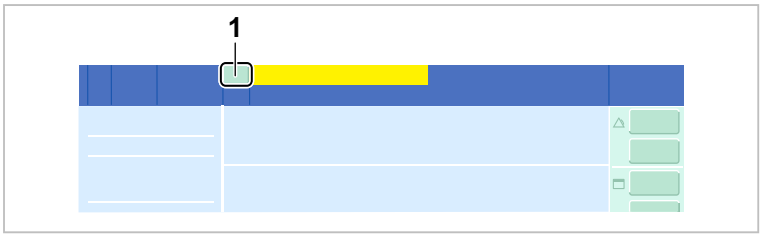
10.3.3 Downgrading and acknowledging alarm messages

Some alarms can be downgraded to low priority (note) or they can be cleared completely. The relevant alarms can be recognized in the table "Alarm – Cause – Remedy" on page 201 by the following remedial messages:

Remedial message	Effect
Use "ALARM RESET" to downgrade alarm priority.	Alarm priority is changed to low (note).
Use "ALARM RESET" to acknowledge alarm.	Alarm is cleared.

There are 2 options for downgrading or clearing the alarms:

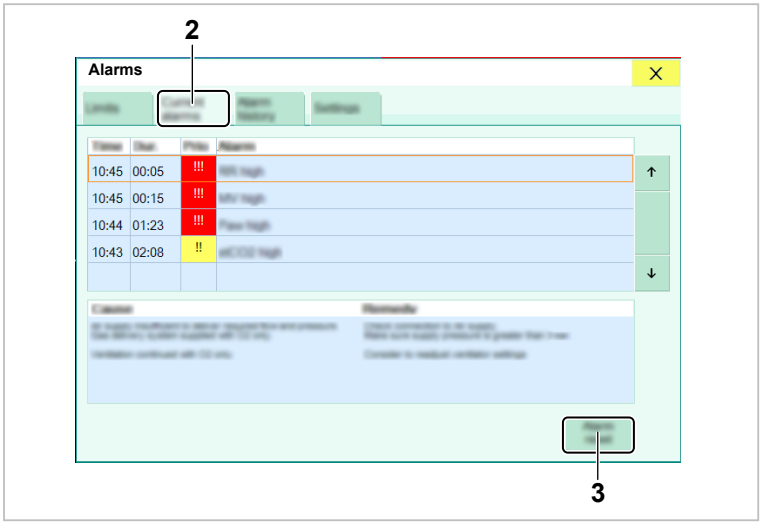
Option 1:



36008

Or

Option 2:



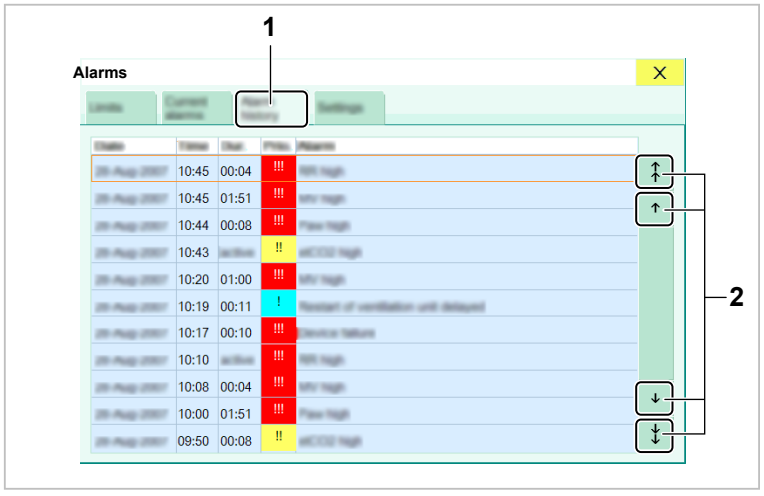
36011

Option 1	Option 2
Touch the ***ALARM RESET*** button (1) in the header bar and confirm.	In the ***Alarms*** > ***Current alarms*** dialog (2), touch the ***Reset all*** button (3) and confirm.
All the alarms displayed in the alarm message field will be downgraded or reset.	All alarms will be downgraded or reset.

10.3.4 Opening the alarm logbook

The alarm logbook records all alarm messages for the current case in chronological sequence.

1. Open the ***Alarms*** dialog.
2. Touch the ***Alarm logbook*** tab (1).



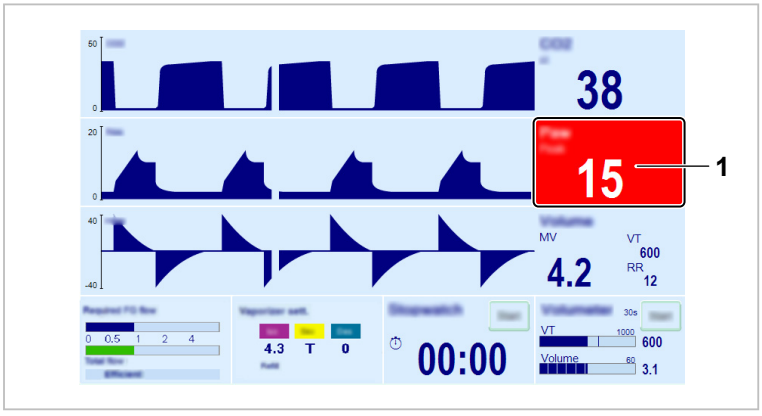
36010

Use the rotary knob or the arrow buttons (2) to scroll the cursor up or down.

The alarm logbook is cleared when the device is shut down or a new case is started.

10.3.5 Adjusting the alarm limits

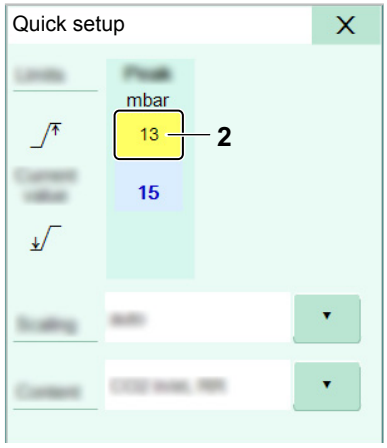
If an alarm is triggered because a lower limit or an upper limit is exceeded, it might be necessary to adjust the alarm limits. To do this, either set the alarm limits, see page 116, or change the alarm limits using the ***Quick setup*** dialog.



36015

1. Touch the parameter field (1).

The relevant alarm limit (2) is preselected.



2. Adjust the value (2) and confirm.

The device can be configured so that the ***Quick setup*** dialog opens automatically in the event of an alarm, see page 170.

10.4 Adopting alarm settings when changing the ventilation mode

When the ventilation mode is changed, the alarm settings are also adapted.

Depending on the mode, alarm settings can either be adopted or set to Off.

For some modes, it can be configured whether or not the settings are adopted. Observe the information in the following section: "Vertical tab "Config. 2"", page 171

However, the settings can be adjusted during operation at any time.

<table>
<tr><th>Alarm or alarm limit</th><th>CBM mode</th><th>Pause</th><th>Man/Spon,
PSV with ΔPsupp
<5 hPa (cmH2O)</th><th>Ext. FGO</th><th>VC,
VC - AF,
PC,
PSV with ΔPsupp ≥5 hPa
(cmH2O)</th></tr>
<tr><td>FiO2 low1)</td><td>Is adopted.</td><td colspan="2">Is adopted.</td><td rowspan="2">Not measured</td><td rowspan="14">Is restored or remains active.</td></tr>
<tr><td>FiO2 high1)</td><td>Configurable</td><td colspan="2">Configurable</td></tr>
<tr><td>FiO2 low2)</td><td colspan="4" rowspan="2">Is adopted.</td></tr>
<tr><td>inAgent high2)</td></tr>
<tr><td>Apnea (no CO2)2)</td><td rowspan="4">Off</td><td>Off3)</td><td colspan="2">Is adopted.</td></tr>
<tr><td>etCO2 high2)</td><td colspan="3" rowspan="4">Configurable</td></tr>
<tr><td>etCO2 low2)</td></tr>
<tr><td>inCO2 high2)</td></tr>
<tr><td>FiO2 high2)</td><td rowspan="2">Configurable</td></tr>
<tr><td>inAgent low2)</td></tr>
<tr><td>xMAC low2)</td><td>Not activated</td></tr>
<tr><td>Paw high</td><td rowspan="2">Is adopted.</td><td colspan="2" rowspan="2">Is adopted.</td><td rowspan="4">Not measured</td></tr>
<tr><td>Paw low</td></tr>
<tr><td>MV high</td><td rowspan="2">Configurable</td><td rowspan="3">Off</td><td rowspan="2">Configurable</td></tr>
<tr><td>MV low</td></tr>
<tr><td>Apnea (no flow)</td><td>Configu-
rable4)</td><td>Off3)</td><td rowspan="2">On</td></tr>
<tr><td>Apnea (no pressure)</td><td>Off</td><td colspan="2">Off</td></tr>
</table>

1) With inspiratory O2 measurement with O2 sensor
2) With integrated patient-gas measurement module
3) The alarm remains suppressed until respiratory activity is detected.
4) This alarm is only activated when the MV low alarm limit is also activated.

10.4.1 Activating the alarms related to volume

The upper alarm limit for ***MV*** is deactivated at the start of the ventilation, but can be set during the ventilation.

The ***MV low*** alarm is delayed in certain cases and is issued as follows:

– No sooner than 45 seconds after a case starts,
– No sooner than 45 seconds after changing to a mode with greater respiratory support, see page 299,
– No sooner than 45 seconds after an ***Apnea (no flow)*** alarm or an ***Apnea (no pressure)*** alarm.

10.4.2 Resetting the Apnea (no CO_2) alarm

Prerequisite: The device has the "Integrated patient-gas measurement module" option.

When changing to a ventilation mode with higher respiratory support, the ***Apnea (no CO_2)*** alarm is reset. If the apnea situation persists, an alarm appears after the time specified in table "Alarm delay and alarm escalation".

10.5 Alarm delay and alarm escalation

To prevent unnecessary alarms, some alarms are not displayed immediately after a limit violation, but after a delay. In addition, certain circumstances can cause the alarm priority to change.

Gas measurement alarms with integrated patient-gas measurement module

Alarm	Priority Note (Low)	Priority Caution (Medium)	Priority Warning (High)
inCO_2 high etCO_2 high etCO_2 low FiO_2 high Inspiratory N_2O high	**---**	After 2 consecutive respiratory phases and 15 seconds	**---**
inAgent low	After 2 consecutive respiratory phases and 15 seconds	**---**	**---**
FiO_2 low	**---**	**---**	After 2 consecutive respiratory phases and 15 seconds or after 30 seconds if no respiratory phases are detected

Alarm	Priority Note (Low)	Priority Caution (Medium)	Priority Warning (High)
inAgent high	---	After 2 consecutive respiratory phases and 15 seconds or after 30 seconds if no respiratory phases are detected	>165 seconds later
Inspiratory xMAC high	---	Insp. MAC ≥3 for more than 180 seconds	longer than 30 seconds: insp. MAC ≥3 and exp. MAC ≥2.5 or insp. MAC ≥5
xMAC low	0 to 60 seconds	>60 s	---
Apnea (no CO_2)	---	At the latest after 20 seconds (for RR ≥6) or At the latest after 35 seconds (for RR <6) or at the latest after 65 seconds for the Pause, Manual / Spontaneous and Ext. FGO modes	15 seconds later (for RR ≥6) or 30 seconds later (for RR <6)
No CO_2 detected	>60 s	---	---
O_2 measurement not available N_2O measurement not available Agent measurement not available O_2 measurement temporarily inaccurate CO_2 sensor accuracy low Agent measurement temporarily inaccurate N_2O measurement temporarily inaccurate Measured gas concentrations temporarily inaccurate	>20 s	---	---

Gas measurement alarms with inspiratory O_2 measurement

Alarm	Priority Note (Low)	Priority Caution (Medium)	Priority Warning (High)
FiO_2 low	---		After at least 5 seconds
FiO_2 high	---	After at least 5 seconds	
O_2 measurement not available O_2 measurement temporarily inaccurate O_2 sensor not ready	>20 s	---	---

Ventilation alarms

Alarm	Priority Note (Low)	Priority Caution (Medium)	Priority Warning (High)
Apnea (no flow) Apnea (no pressure) Apnea	---	At the latest after 20 seconds (for RR ≥6) or At the latest after 35 seconds (for RR <6) or at the latest after 65 seconds for the Pause, Manual / Spontaneous and Ext. FGO modes	15 seconds later (for RR ≥6) or 30 seconds later (for RR <6)
Apnea Ventilation	At the latest after 20 seconds (15 seconds for RRmin ≥4) (configurable, see page 168)		---
Tidal volume not achieved	---	After 3 consecutive breaths	---
Airway press. continuously high	---	---	>15 seconds above the manually or automatically set limit
Airway pressure negative	---	---	Pmean < –2 or Paw < –10
PEEP/CPAP high	---	Airway pressure >(PEEP +5 hPa (cmH_2O)) during more than 10 consecutive breaths	---
Airway pressure not achieved	---	After 2 consecutive breaths	---

Alarm	Priority Note (Low)	Priority Caution (Medium)	Priority Warning (High)
Cardiac bypass mode still active?	If a minute volume of >50 % of the suggested value is measured after CBM mode has been activated for >60 seconds	---	---
Fresh gas low or leakage	---	Breathing bag empty	With an additional "Apnea (no pressure)" alarm and at least one of the following alarms: "Apnea (no flow)", "Tidal volume not achieved" or "Airway pressure not achieved"

10.6 Activation of alarms after breath detection

Product variants with inspiratory O_2 measurement or integrated patient-gas measurement module

In the ***Man / Spon*** mode, the alarms for ***Minute volume low*** and ***Apnea (no flow)*** are only activated after spontaneous breaths have been detected.

Product variants with integrated patient-gas measurement module

If still no breaths have been detected after leaving the ***Standby*** or ***Pause*** modes, the breathing gas is monitored with regard to an O_2 concentration that is too low or an anesthetic gas concentration that is too high. At the same time, the message ***Waiting for respiratory phases*** is displayed in the CO_2 waveform.

Once 2 breaths have been detected, the message disappears and only then are the O_2, CO_2, N_2O, and anesthetic gas alarms active.

10.7 Intelligent alarm behavior

10.7.1 Combined alarms

If multiple alarms occurring at the same time are caused by the same problem, they are combined into one alarm.

Problem	Alarms occurring at the same time	Combined alarm
Several causes of apnea are present.	***Apnea (no flow)*** ***Apnea (no pressure)*** ***Apnea (no CO_2)***	***Apnea***
Faults in multiple components. This causes failure of a system function.	Example: ***Insp. press. sensor failure*** ***Exp. pressure sensor failure***	***Ventilator failure***

10.7.2 Limited generation of alarms

Some low-priority alarms indicate a fault in a measurement function. If this measurement function monitors parameters, no alarms based on these parameters can be generated.

Example:

Fault	Displayed alarm	Non-generated alarm
CO_2 measurement is faulty	***Sample line occluded***	***Apnea (no CO_2)***

11 Configuration

11.1 Device settings

Some device functions are available as an option and consequently are only available on appropriately equipped devices.

11.1.1 Factory defaults

Dräger delivers the device with factory defaults that are used when starting the device for the first time. Service personnel can reset the device to the factory defaults.

11.1.2 Start settings

Start settings take effect after every restart of the device or when starting a new case (touching one of the ***New adult***, ***New pediatric*** or ***New neonate*** buttons). The start settings can be adjusted after the configuration password is entered.

If required, the device can be delivered with start settings that may differ from the factory defaults.

11.1.3 User-specific settings

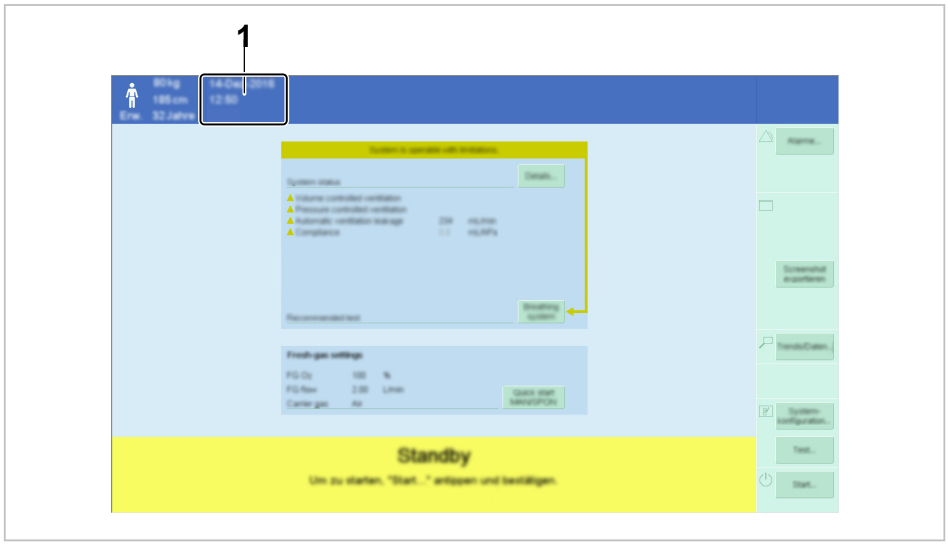
User-specific settings can be adjusted by the user without a configuration password. The settings take effect immediately but are discarded at the latest after a device restart.

11.2 Setting the date and time

The device can adopt the time from a network or from a device connected via MEDIBUS. The time synchronization takes place shortly after switch-on and at regular intervals thereafter.

If time synchronization is not set, the time can be changed manually in 2 ways:

► Touch the field (1).



► Set the date and time in the system setup.
The source for the time synchronization can also be set in the system setup. For further information, see the following chapter: "Vertical tab "General"", page 176.

11.3 Specifying the start settings

As soon as a vertical tab is selected, entry of the configuration password is required to access the settings in the ***System setup*** dialog.

Observe the information in the following chapter: "Password", page 325.

11.3.1 Adjusting the settings

The following tables show all the setting possibilities in the ***System setup*** dialog.

The respective factory defaults are marked in **bold** format.

11.3.2 System setup > Screen

11.3.2.1 Vertical tab "General"

Headline/ Parameter	Setting range			Description
				
Color scheme	**Day light**; Day dark; Night			Sets the color scheme. Observe the information in the following section: "Daytime colors and nighttime colors", page 84
Screen brightness	10 to 100 **80**			Sets the screen brightness.

11.3.2.2 Vertical tab "Views"

Headline/ Parameter	Setting range			Description
				
Rename views	1 Standard; 2 Expert; 3 Expert			Defines the name of a view. Touch the button for the view, enter the new name on the keyboard, and confirm with the ↵ button or with the rotary knob.
Number of waveforms (view 3)	**3**; 4			
Default view	**1 Standard**; 2 Expert; 3 Expert			Specifies the standard view.
Save as system defaults	Current view (only available during operation)			Saves the current screen layout.
	All views			Saves all screen layouts.

11.3.2.3 Vertical tab "Waveforms"

Headline/ Parameter	Setting range			Description
				
Sweep speed [mm/s]	**6.25**; 12.5; 25	**6.25**; 12.5; 25	6.25; **12.5**; 25	Specifies the sweep speed.
VT scale [mL]	**Auto**; 0 to 10; 0 to 50; 0 to 150; 0 to 500; 0 to 1000; 0 to 2000	**Auto**; 0 to 10; 0 to 50; 0 to 150; 0 to 500; 0 to 1000; 0 to 2000	**Auto**; 0 to 10; 0 to 50; 0 to 150; 0 to 500; 0 to 1000; 0 to 2000	Specifies the scale for the volumeter.
Flow scale [L/min]	**Auto** -5 to 5 -10 to 10; -30 to 30; -60 to 60; -120 to 120	**Auto** -5 to 5 -10 to 10; -30 to 30; -60 to 60; -120 to 120	**Auto** -5 to 5 -10 to 10; -30 to 30; -60 to 60; -120 to 120	Specifies the scale for the flow waveform.
O_2 scale [%]	**Auto**; 0 to 100; 15 to 35; 25 to 45; 35 to 55; 45 to 65; 55 to 75; 65 to 85; 75 to 95; 85 to 105			Specifies the scale for the O_2 waveform.
CO_2 scale	[%]; [kPa]: **Auto**; 0 to 6; 0 to 12 [mmHg]: **Auto**; 0 to 50; 0 to 100			Specifies the scale for the CO_2 waveform.
Paw scale [mbar]; [hPa]; [cmH_2O]	**Auto**; -5 to 20; -7.5 to 30; -10 to 40; -20 to 80			Specifies the scale for the Paw waveform.
Flow-volume loop	**ISO standard**; Dräger			Specifies coordinate axes for the Flow-Volume loop.

11.3.2.4 Vertical tab "Colors"

Headline/ Parameter	Setting range			Description
				
CO_2; Paw; Flow, volume	**Default color**; color palette with 7 additional colors			Specifies the parameter colors.
O_2; Agent	**Default color**; ISO color			

11.3.3 System setup > Alarms

11.3.3.1 Vertical tab "Limits"

Headline/ Parameter	Setting range			Description
				
FiO2 ⚠ [%]	19 to 99; **Off**	19 to 99; **Off**	19 to 99; Off **90**	Inspiratory oxygen fraction
FiO2 ⚠ [%]	18 to 98 **20**	18 to 98 **20**	18 to 98 **20**	
etCO2 ⚠ [%]; [kPa] [mmHg]	0.1 to 9.8; Off **7.0** 1 to 75; Off **53**	0.1 to 9.8; Off **7.0** 1 to 75; Off **53**	0.1 to 9.8; Off **7.0** 1 to 75; Off **53**	Expiratory CO2 concentration
etCO2 ⚠ [%]; [kPa] [mmHg]	**Off**; 0.0 to 9.7; **Off**; 0 to 74	**Off**; 0.0 to 9.7; **Off**; 0 to 74	**Off**; 0.0 to 9.7; **Off**; 0 to 74	
inCO2 ⚠ [%]; [kPa] [mmHg]	0.1 to 1.4; Off **1.1** 1 to 10; Off **8**	0.1 to 1.4; Off **1.1** 1 to 10; Off **8**	0.1 to 1.4; Off **1.1** 1 to 10; Off **8**	Inspiratory CO2 concentration
Paw high ⚠ [mbar]; [hPa]; [cmH2O]	5 to 99 **40**	5 to 99 **25**	5 to 99 **20**	Airway pressure If the airway pressure is above the value set for Paw low for longer than 15 s, the Airway press. continuously high alarm is issued.
Paw low ⚠ [mbar]; [hPa]; [cmH2O]	**Auto**; 3 to 97	**Auto**; 3 to 97	**Auto**; 3 to 97	
inSev ⚠ [%]; [kPa]	0.10 to 9.95 **4.40**	0.10 to 9.95 **5.10**	0.10 to 9.95 **6.70**	Sevoflurane
inSev ⚠ [%]; [kPa]	**Off**; 0.00 to 9.85	**Off**; 0.00 to 9.85	**Off**; 0.00 to 9.85	
inDes ⚠ [%]; [kPa]	0.1 to 20.0 **12.5**	0.1 to 20.0 **14.5**	0.1 to 20.0 **19.0**	Desflurane
inDes ⚠ [%]; [kPa]	**Off**; 0.0 to 19.9	**Off**; 0.0 to 19.9	**Off**; 0.0 to 19.9	

Headline/ Parameter	Setting range			Description
inEnf ▲ [%]; [kPa]	0.10 to 9.95 **3.60**	0.10 to 9.95 **4.10**	0.10 to 9.95 **5.40**	Enflurane
inEnf ▼ [%]; [kPa]	**Off**; 0.00 to 9.85	**Off**; 0.00 to 9.85	**Off**; 0.00 to 9.85	
inIso ▲ [%]; [kPa]	0.10 to 8.50 **2.40**	0.10 to 8.50 **2.80**	0.10 to 8.50 **3.70**	Isoflurane
inIso ▼ [%]; [kPa]	**Off**; 0.00 to 8.40	**Off**; 0.00 to 8.40	**Off**; 0.00 to 8.40	
inHal ▲ [%]; [kPa]	0.10 to 8.50 **1.60**	0.10 to 8.50 **1.90**	0.10 to 8.50 **2.40**	Halothane
inHal ▼ [%]; [kPa]	**Off**; 0.00 to 8.40	**Off**; 0.00 to 8.40	**Off**; 0.00 to 8.40	

11.3.3.2 Vertical tab "Sound volume"

Headline/ Parameter	Setting range			Description
Alarm volume	10 to 100 **40**			Sets the alarm volume.
Minimum alarm volume	10 to 100 **10**			Sets the minimum volume with which an alarm tone will be signaled.

11.3.3.3 Vertical tab "Autoset"

Headline/ Parameter	Setting range			Description
Offset for "Autoset limits" function				
	Automatic adjustment of the parameters to current measured values. For further information, see the following section: "Setting the alarm limits", page 116.. By touching the Autoset button, the alarm limits are adjusted so that the upper alarm limit is above the current measured value by at least the percentage or value set here and the lower alarm value is correspondingly below it. Example: In the PC - CMV mode: Measured MV: 5 L/min Set offset: ±40 % New alarm limits: 7 and 3 L/min			
$etCO_2$ ± [%]	Off; 20 to 80 **20**			In modes with low or no breathing support (Man / Spon, Ext. FGO, CPAP / PSV, and Pause), a further 20 percentage points are added to the configured value.

Headline/ Parameter	Setting range			Description
Paw +[mbar]; [hPa]; [cmH2O]	Off; 5 to 20 **5**			The following parameters are taken into account when determining the Paw value: PIP, Pplat, Pinsp, PEEP, and ΔPsupp. In the Man / Spon and Pause modes, the new alarm limit is at least 25 hPa (cmH2O).
MV ± [%]	Off; 20 to 80 **40**			In modes with low or no breathing support (Man / Spon, CPAP / PSV, and Pause), a further 20 percentage points are added to the configured value.

11.3.3.4 Vertical tab "Config. 1"

Headline/ Parameter	Setting range			Description
General alarm behavior				
Open "Quick setup" when alarm occurs	**On**; Off			Automatically opens the Quick setup dialog in the event of an alarm.
"Second agent detected" alarm	**On**; Off			Issues an alarm when an anesthetic gas mixture is detected.
"xMAC low" alarm	**On**; Off			Activates the xMAC low alarm.
"FiO2 too high for neonates" threshold value [%]	**50**; 25 to 90			Sets the FiO2 value that is considered critical for neonates. If this value is exceeded for a certain time, the FiO2 too high for neonates alarm will be triggered.
"FiO2 too high for neonates" alarm after [h:mm]	Off; 0:10 to 9:50 **0:15**			Sets the time after which the FiO2 too high for neonates alarm will be triggered.
Priority of "Apnea ventilation" alarm	**Medium**; Low			Specifies the alarm priority when the set minimum respiratory rate is not reached in PSV ventilation mode.
Alarm behavior in "Pause" mode				
Priority of "Pause time expired" alarm	**High**; Medium; Low			Specifies the alarm priority for the alarm that is issued when the time set in the Pause mode has expired.
Default value for "Timer" [mm:ss]	0:30 to 2:00 **2.00**	0:30 to 2:00 **1:00**	0:30 to 2:00 **0:30**	Specifies the default duration for Pause.

11.3.3.5 Vertical tab "Config. 2"

Headline/ Parameter	Setting range			Description
				
Deactivate the alarm limit in the following modes: Man/Spon, Pause, CPAP/PSV with ΔPsupp < 5, ext. FGO				
FiO_2 high	Yes; **No**	Yes; **No**	Yes; **No**	Specifies the alarm behavior when changing to a different ventilation mode. These settings apply only to a change to a ventilation mode with lower or no breathing support (see page 299). The alarm behavior at the start of the therapy is defined by the configuration in the vertical tab ***Limits***.
MV low	**Yes**; No			
MV high	**Yes**; No			
xMAC low	Yes; **No**			
$etCO_2$ low	**Yes**; No			
$etCO_2$ high	**Yes**; No			
$inCO_2$ high	**Yes**; No			
inAgent low	**Yes**; No			
Deactivate the alarm limit in cardiac bypass mode (CBM)?				
FiO_2 high	Yes; **No**			Specifies the alarm behavior in the CBM mode.
MV low	**Yes**; No			
MV high	**Yes**; No			
inAgent low	**Yes**; No			

11.3.3.6 Vertical tab "Config. 3"

Headline/ Parameter	Setting range			Description
				
Alarm limits for "Cylinder almost empty"				
O_2	[bar]; [kPax100]: Off; 15 to 50 **20** [psi]: Off; 218 to 725 **290**			Specifies the alarm limits for the supply pressure of connected gas cylinders.
Air	[bar]; [kPax100]: Off; 15 to 50 **20** [psi]: Off; 218 to 725 **290**			
N_2O	[bar]; [kPax100]: Off; 15 to 40 **20** [psi]: Off; 218 to 580 **290**			

11.3.4 System setup > Therapy

11.3.4.1 Vertical tab "Vent. 1"

Headline/ Parameter	Setting range			Description
				
Default ventilation mode	Buttons with available ventilation modes **Man/Spon**			Specifies the default ventilation mode at the start of therapy.
VT and RR start settings				Specifies the tidal volume and the respiratory rate.
Based on	Patient category; **Ideal body weight**			
Selected: [Patient category]				Specifies the tidal volume and the respiratory rate based on the patient category.
VT [mL]	5 to 1500 **500**	5 to 1500 **150**	5 to 1500 **50**	
RR [/min]	3 to 100 **12**	3 to 100 **20**	3 to 100 **30**	
Selected: [Ideal body weight]				Specifies the tidal volume and the respiratory rate that are based on the ideal body weight. Set the tidal volume and the respiratory rate for the supporting points 5; 15; 75; 100 kg (11; 33; 165; 220 lbs). For calculated values for ideal body weights that lie between these 4 supporting points, the start settings for tidal volume and respiratory rate are interpolated linearly. For ideal body weight values lying outside these supporting points, calculation proceeds with the values of the highest or lowest supporting point.
VT [mL]	5 to 1500 100 kg (220 lbs): **700** 75 kg (165 lbs): **520** 15 kg (33 lbs): **110** 5 kg (11 lbs): **35**			
RR [/min]	3 to 100 100 kg (220 lbs): **10** 75 kg (165 lbs): **12** 15 kg (33 lbs): **26** 5 kg (11 lbs): **32**			

The start settings for VT and RR influence the start values of the alarm limits for MV high, MV low, and VTi high:

MV high = VTx RR x (1 + offset);
minimal: 2.0 L/min

MV low = VTx RR x (1 – offset);
minimal: 0.3 L/min

The "offset" value corresponds to the respective offset setting for automatic alarm adjustment. The "offset" value can be set in vertical tab ***System setup*** > ***Alarms*** > ***Autoset***.

11.3.4.2 Vertical tab "Vent. 2"

Headline/ Parameter	Setting range			Description
				
Start settings for ventilation				Specifies the start settings for the ventilation.
Pmax [mbar]; [hPa]; [cmH2O]	12 to 80 **40**	12 to 80 **30**	12 to 80 **25**	
Pinsp [mbar]; [hPa]; [cmH2O]	7 to 80 **15**	7 to 80 **15**	7 to 80 **15**	
ΔPsupp [mbar]; [hPa]; [cmH2O]	Off; 3 to 80 **10**	Off; 3 to 80 **10**	Off; 3 to 80 **10**	
Insp term [%]	5 to 80 **25**	5 to 80 **25**	5 to 80 **25**	
PEEP [mbar]; [hPa]; [cmH2O]	Off; 2 to 35 **3**	Off; 2 to 35 **3**	Off; 2 to 35 **3**	
Slope [s]	0 to 2 **0.2**	0 to 1.5 **0.2**	0 to 1.5 **0.2**	
RRmin [/min]	Off; 3 to 25 **6**	Off; 3 to 25 **10**	Off; 3 to 25 **15**	
% Tplat [%]	0 to 60 **20**	0 to 60 **20**	0 to 60 **20**	
Trigger [L/min]	0.3 to 15 **4.0**	0.3 to 15 **2.0**	0.3 to 15 **1.0**	
Sync.	SIMV; **CMV**	SIMV; **CMV**	SIMV; **CMV**	

11.3.4.3 Vertical tab "Fresh gas" (only with electronically controlled gas mixer)

Headline/ Parameter	Setting range			Description
				
Start settings for fresh gas				Selects the start settings for the fresh-gas delivery.
FG O2 [%]	21 to 100 **100**	21 to 100 **100**	21 to 100 **100**	Sets the O2 flow.
FG flow [L/min]	0.20 to 15.00 **2.00**	0.20 to 15.00 **2.00**	0.20 to 15.00 **2.00**	Sets the fresh-gas flow.

Headline/ Parameter	Setting range			Description
Minimal O_2 flow (carrier gas: Air) [mL/min]	Off; 50 to 300 **Off**	Off; 50 to 300 **Off**	Off; 50 to 300 **Off**	Sets the minimal O_2 flow that is delivered when Air is used as carrier gas. Do not set the value too low, but suitable for the patient category. The recommendation is, e.g., 200 for adults, 100 for pediatric patients, and 50 for neonates.
Minimal O_2 flow (carrier gas: N_2O) [mL/min]	50 to 300 **200**	50 to 300 **200**	50 to 300 **200**	Sets the minimum O_2 flow that is delivered when N_2O is used as carrier gas. Do not set this value too small; recommended is, e.g., 200 for adults, 100 for pediatric patients, and 50 for neonates.
Carrier gas	**Air**; N_2O	**Air**; N_2O	**Air**; N_2O	Sets the carrier gas.

11.3.4.4 Vertical tab "Patient"

Headline/ Parameter	Setting range			Description
Default selection for "Start" dialog	Continue case; **New adult**; New pediatric; New neonate			Specifies which button is preselected the first time the Start dialog is opened, and after changes to the system setup.
Weight [kg] [lbs]	Off; 30 to 300 **Off** Off; 67 to 661 **176**	Off; 5 to 50 **Off** Off;12 to 110 **55**	0.4 to 10 **3.0** 0.9 to 22 **6.6**	Specifies the following starting values: – Body weight – Body height – Patient age If the setting is configured to **Off**, the corresponding therapy control will not be displayed in the Start dialog.
Height [cm] [in]	120 to 300 **185** 48 to 118 **73**	50 to 300 **100** 20 to 118 **39**	Off; 20 to 80 **Off** Off; 8 to 31 **Off**	
Age [years, Neo: months]	12 to 130 **32**	0 to 16 **8**	0 to 24 **6**	

11.3.4.5 Vertical tab "General"

Headline/ Parameter	Setting range			Description
Pinsp changes with PEEP	**On**; Off			Determines whether changing PEEP automatically changes Pinsp also, so that the difference between PEEP and Pinsp remains constant.
Ti changes with RR (I:E ratio is locked)	**On**; Off			Determines whether the change in respiratory rate automatically effects a change in Ti, so that the I:E.ratio remains constant.
Breathing system warmer	**On**; Off			Switches the breathing system warmer on or off.
Auto Wake-up (opens start dialog upon respiratory activity)	**On**; Off			Determines whether the Start dialog opens automatically when ventilation activity is detected (e.g., as a result of repeated squeezing of the breathing bag).
Anesthetic gas compensation	Auto; **Off**; Des; Sev			Corrects the accuracy of the flow measurement on devices with inspiratory O_2 measurement. Select the value according to the typical setting on the vaporizer control dial. (The vaporizer automatically makes any correction necessary for altitude.)
Des		0 to 18 **6**		
Sev		0 to 6.5 **2.1**		

11.3.5 System setup > Licenses/Options

11.3.5.1 Vertical tab "Licenses/Options"

Headline/ Parameter	Setting range			Description
Licenses for software options				– Overview of available and active software options. – Activating software options. Observe the information in the following section: "Activating software options", page 182

Headline/ Parameter	Setting range			Description
				
Gas supply				
Disable N_2O	On; **Off**			A device with connectors for nitrous oxide can be configured so that nitrous oxide is no longer displayed, nor can it be selected as a carrier gas. Prerequisite: – The current carrier gas is Air. – Nitrous oxide is not connected or available. Restart the device if necessary to implement the settings. On: Nitrous oxide cannot be delivered. Off: Nitrous oxide can be delivered.

11.3.6 System setup > System

11.3.6.1 Vertical tab "General"

Headline/ Parameter	Setting range			Description
				
Language	List of available languages **English (United States)**			Selects the language. A flag symbol identifies the tabs that lead to the page with the language settings.
Time source	MEDIBUS 1; MEDIBUS 2; NTP server; **None**			Selects the source for the time synchronization. Prerequisite: The connected device supports this function.
Date and time	day; month; year hour; minute			Sets the date and time. The change is applied on leaving the "General" vertical tab.
Automatic switch to daylight savings time	**On**; Off			Activates or deactivates the automatic changeover to daylight saving time.
OR working hours	Hour : Minute to Hour : Minute **6:30 to 18:30**			Sets the working hours of the operating room. During this time, the gas measurement is kept in a pre-warmed and calibrated state so measured values are available after only a short waiting period. However, this decreases the life span of the patient-gas measurement module.
Device name	Device name (up to 16 alphanumeric characters) **A3XX**			Changes the device name in order, e.g., to enter the operating location.

Headline/ Parameter	Setting range			Description
Configuration password	Change password			Changes the configuration password.
Reset all pages to	Factory defaults			Resets all the settings on all pages in the System setup dialog to the factory defaults.

11.3.6.2 Vertical tab "Units"

Headline/ Parameter	Setting range			Description
Weight	**kg**; lbs			Sets the units.
Height	**cm**; in			
Airway pressure	mbar; **hPa**; cmH_2O			
Supply pressure	bar; **kPa×100**; psi			
CO_2	%; kPa; **mmHg**			
Volatile agents	**%**; kPa			

11.3.6.3 Vertical tab "System test"

Headline/ Parameter	Setting range			Description
General				
Always use walk-through mode	**On**; Off			Sets the walk-through mode function. When On is configured, system tests and leakage tests will always be executed in walk-through mode.
Sample line is connected during test	**On**; Off			Specifies whether the sample line is connected to the Y-piece or to the filter on the Y-piece during the automatic tests. When On is configured, the device can automatically check whether, e.g., breathing hoses or central supply hoses are incorrectly connected. When Off is configured, additional checks are required during the system test.
Test gas supply				

Headline/ Parameter	Setting range			Description
				
Central O_2 supply	**On**; Off			Specifies which gas supplies are tested during the automatic system test.
Central Air supply	**On**; Off			
Central N_2O supply	**On**; Off			
O_2 cylinder Air cylinder N_2O cylinder	**On**; Off			
Verify O_2 delivery	**On**; Off			Specifies whether the system test will check that the O_2 supply is actually delivering oxygen. The Sample line is connected during test parameter must also be set to On for this.
Test breathing circuit				
Test correct assembly of breathing hoses and Y-piece	**On**; Off			Specifies whether the automatic tests will check that the breathing circuit is correctly connected. During this test, a check is made as to whether the breathing gas can flow from the inspiratory port via the Y-piece to the expiratory port. If Sample line is connected during test is set to On, this test is performed fully automatically. If Sample line is connected during test is set to Off, additional manual checks are required.

11.3.6.4 Vertical tab "Logbook"

Headline/ Parameter	Setting range			Description
				
A logbook entry with measured values is created				Enables the creation of additional logbook entries with measured values.
Every	1 min; 2 min; **5 min**; 10 min; 15 min			Generates periodic entries.
For all high-priority alarms	**On**; Off			Generates entries in the event of an alarm.
For all medium-priority alarms	**On**; Off			

11.3.6.5 Vertical tab "Sound volume"

Headline/ Parameter	Setting range			Description
				
Alarm volume	10 to 100 **40**			Sets the alarm volume.
Minimum alarm volume	10 to 100 **10**			Sets the minimum volume with which an alarm tone will be signaled.

11.3.6.6 Vertical tab "Interfaces"

Headline/ Parameter	Setting range			Description
				
LAN				Configuration of the network
DHCP	On; **Off**			Specifies settings for the network. When using DHCP, consult with IT personnel to ensure that the device is always assigned the same IP address by the DHCP server. Restart the device after each change to the network settings. The network settings are not affected by a reset to factory defaults. Accept the changes to IP address, Subnet mask, or Default gateway with the Apply button. The changes are only active after the device has been restarted.
IP address	XXX . XXX . XXX . XXX			
Subnet mask	XXX . XXX . XXX . XXX			
Default gateway	XXX . XXX . XXX . XXX			
MAC address				Displays the MAC address.
COM 1				Configures the COM port. A baud rate of 19200 or 38400 is required for transmission of high-speed data, e.g., for waveforms.
Protocol	**MEDIBUS.X**; None			
Baud rate	1200; 2400; 4800; 9600; **19200**; 38400			
COM 2				
Protocol	MEDIBUS.X; **None**			
Baud rate	1200; 2400; 4800; 9600; **19200**; 38400			
USB				Activates or deactivates the USB port.
USB interface	**On**; Off			

11.3.6.7 Vertical tab "Infinity ID"

Headline/ Parameter	Setting range			Description
				
Monitoring of Infinity ID accessories				
Breathing circuit	**On**; Off			Activates or deactivates the Infinity ID functionality. On: – Generates a message when the maximum period of use is exceeded – Generates a message when Infinity ID breathing hoses are incorrectly connected Off: – Messages are suppressed.
Water trap	**On**; Off			
Flow sensors	**On**; Off			
CO_2 absorber	**On**; Off			
Exchange interval [days]				
Breathing circuit	Off; 2 to 9 **2**			Specifies the replacement intervals for Infinity ID accessories.
Water trap	Off; **28**			
Flow sensors	Off; 1 to 180 **90**			
CO_2 absorber	Off; 1 to 28 **7**			

11.3.6.8 Vertical tab "Service"

Headline/ Parameter	Setting range			Description
				
Service access code				The following functions are available after the appropriate credentials have been entered: – Access to the service dialog

11.3.7 Resetting the start settings

Certain pages in the ***System setup*** dialog have a button for resetting the respective start settings to the factory defaults.

11.3.7.1 Resetting the changes on a page

1. Open the appropriate tab.
2. Touch the ***Factory defaults*** button and confirm.

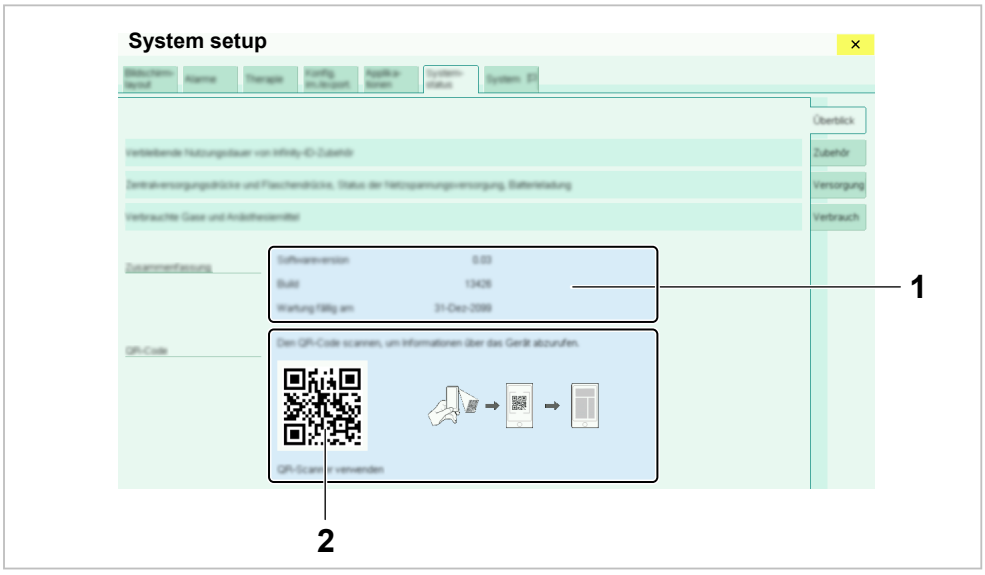
11.3.8 Resetting the consumptions

The gas consumption can be reset in ***Standby*** > ***System setup*** > ***System status*** > ***Consumption***.

► Touch the ***Reset data*** button and confirm.

11.3.9 General device information

Further information is displayed in ***Standby*** > ***System setup*** > ***System status***:



No.	Designation
1	General information – Installed software version – Next maintenance date
2	QR code for further product information This information can be retrieved: – Device description – Device options – Available accessories – Service options

► Scan the QR code with suitable equipment.

The QR code is decoded into an internet address which enables access to the stated information in a browser.

11.4 Transferring device configurations

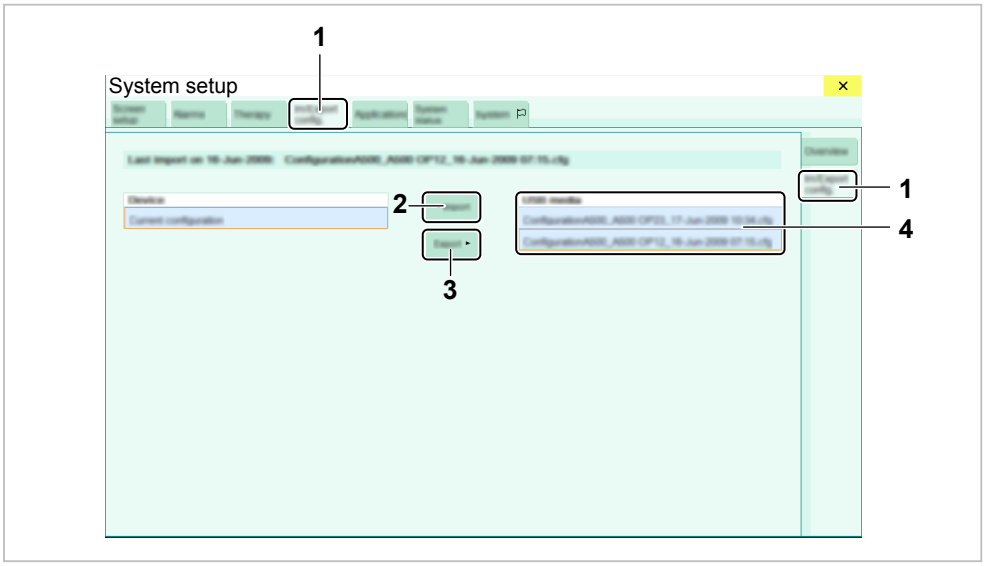
The configuration of a device can be exported to a USB mass storage device and then imported on another device.

The configuration can only be transferred completely if the hardware and software characteristics are identical on both devices. If these characteristics (e.g., gas mixer, gas measurement) are different or if configuration data are missing, certain settings will be reset to the factory defaults or switched off.

ℹ To achieve as complete a transfer as possible, use a device with the greatest possible range of features as the starting point for exporting to a device with fewer features.

Prerequisite: USB mass storage device has been connected to the USB port.

► Open the ***System setup*** > ***Im/Export config.*** > ***Im/Export config.*** page (1).



The configurations saved on the USB mass storage device are displayed in a list (4). If not all of the configurations are displayed, delete all configurations from the USB mass storage device that are not needed or move them to a subdirectory on the USB mass storage device.

The following settings are neither imported nor exported:

– ***Device name***
– ***Date and time***
– ***IP address***

11.4.1 Importing the configuration

1. Touch one of the configurations in the list (4).
2. Touch the ***Import*** button (2) and confirm.
3. Restart the device.
4. Check the device configuration for correctness.

11.4.2 Exporting the configuration

► To export configurations, touch the ***Export*** button (3) and confirm.

11.5 Activating software options

The following software options require an activation code to be entered, followed by activation:

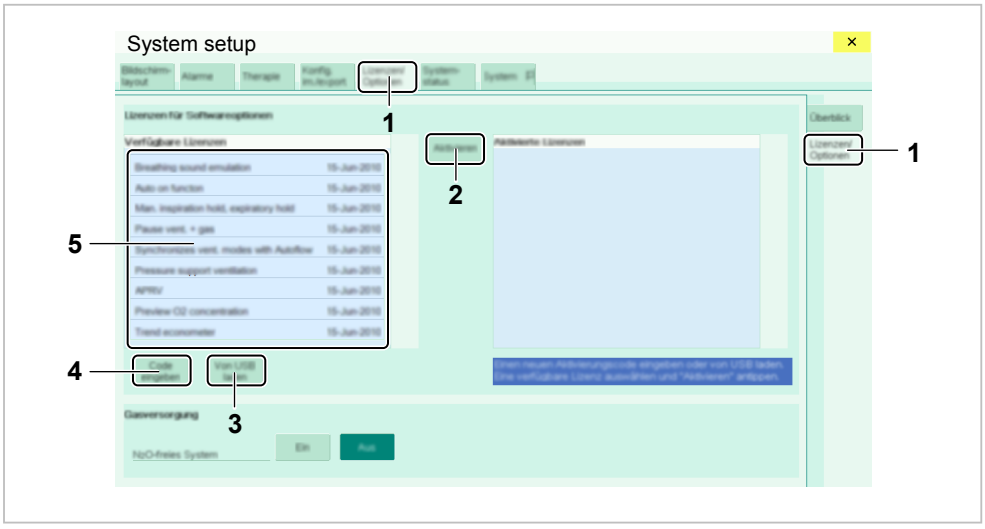
– Spontaneous breathing support
– AutoFlow
– Advanced trends
– Advanced ventilation monitoring
– Advanced gas monitoring

– Advanced neonatal support
– Expert view

Trial licenses for these options are time-limited.

An activation code is linked with the serial number of the respective device and cannot be transferred. The activation codes can either be loaded from a USB mass storage device or entered manually.

► Open the ***System setup*** > ***Licenses/Options*** > ***Licenses/Options*** page (1).



Loading the activation code from a USB mass storage device

Prerequisite: A USB mass storage device with valid licenses is connected to the USB port.

► Touch the ***Load from USB*** button (3).

The activation codes are read and displayed in the list (5).

Entering the activation code

1. Touch the ***Enter code*** button (4).
2. Enter the activation code and confirm with ***OK***.

The license is displayed in the list (5).

Activating the licensed software option

The licensed software options must be activated as follows before they become available:

1. Select the corresponding license from the list (5).
2. Touch the ***Activate*** button (2) and confirm.
3. After activating all desired licenses, restart the device.

11.6 Overview of configurable screen contents

Waveforms and parameter fields are selected in the ***Quick setup*** dialog, see page 109.

11.6.1 Waveforms and associated parameter fields

etCO2

36158

CO2 in/et

36156

CO2 in/et, RR

36157

Paw

36162

Paw (3)

Volume-controlled modes:
Parameters PIP, Pplat, PEEP

All other modes:
Parameters PIP, Pmean, PEEP

36163

Paw (4)

Parameters PIP, Pplat, Pmean, PEEP:

36164

Volume MV, VT, RR

36165

Volume MV, VT

36214

Volume VT, MV, RR

36166

Volume VT, MV

36216

O2

36160

O2, Δ

36161

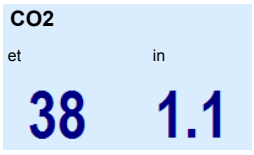
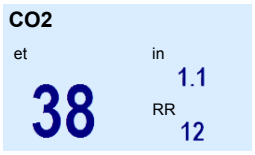
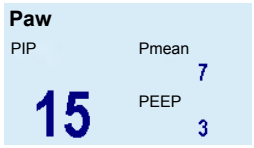
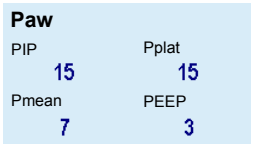
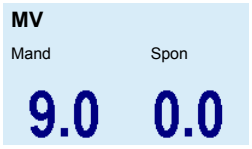
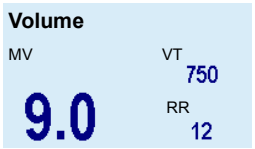
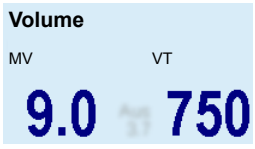
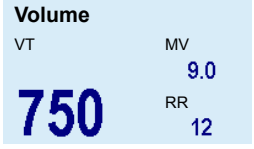
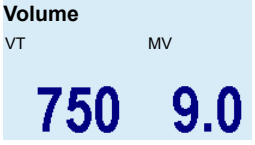
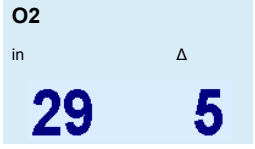
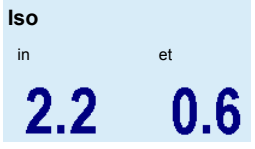
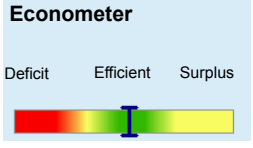
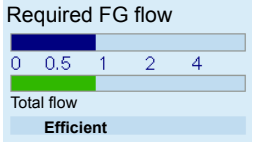
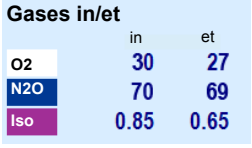
Primary agent

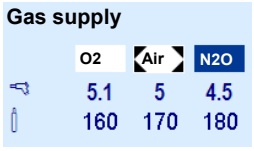
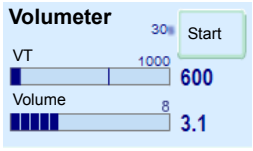
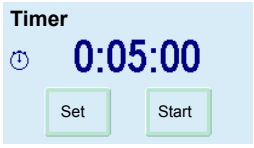
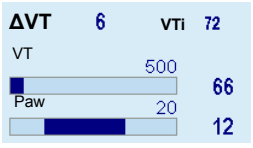
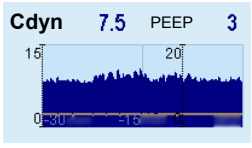
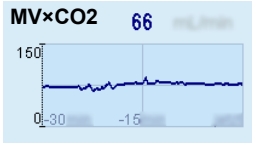
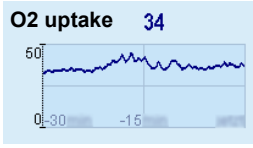
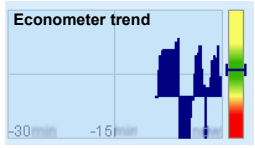
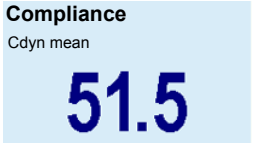
36155

"Empty"

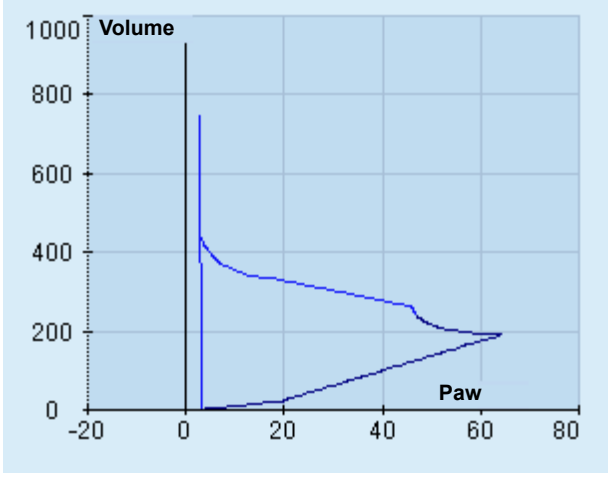
36159

11.6.2 Parameter fields

etCO2 	**CO2 in/et** 	**CO2 in/et, RR** 
Paw 	**Paw (3)**  Volume-controlled modes: Parameters PIP, Pplat, PEEP All other modes: Parameters PIP, Pmean, PEEP	**Paw (4)** 
MVmand, spon 	**MV, VT, RR** 	**MV, VT** 
VT, MV, RR 	**VT, MV** 	**O2** 
O2, Δ 	**Primary agent** 	**RR** 
Econometer 	**Low-flow wizard** 	**Gases in/et** 

Gas supply	Volumeter	Stopwatch
		
Timer	**ΔVT**	**Compliance trend**
		
MV×CO2 trend	**O2 uptake trend**	**Econometer trend**
		
Compliance		
		

PV loop



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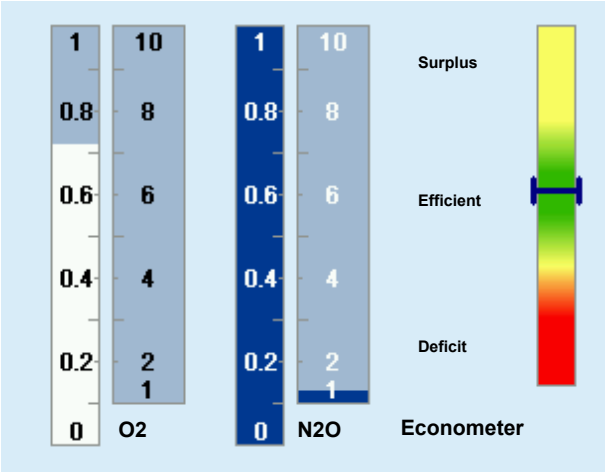
Flow tubes (electronically controlled gas mixer with econometer)



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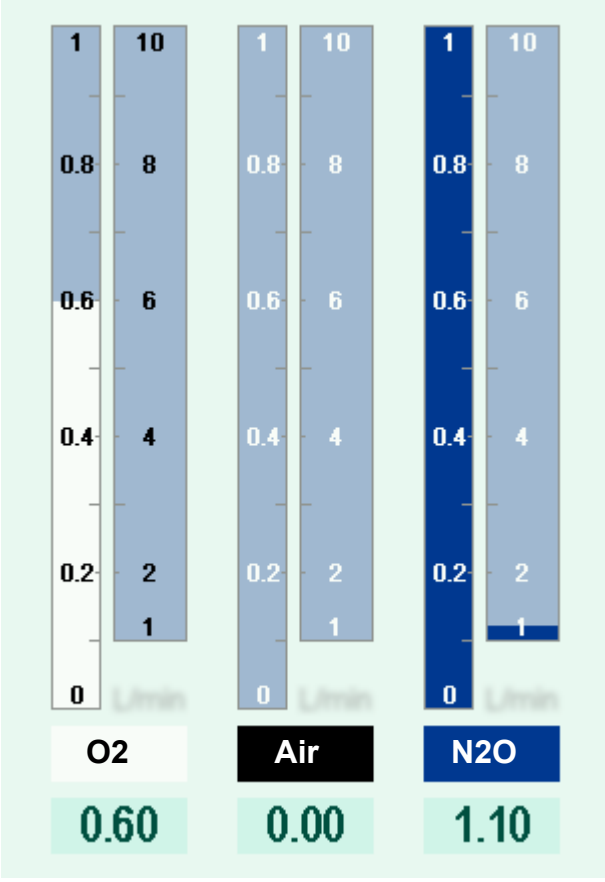
Flow tubes (mechanically controlled gas mixer)



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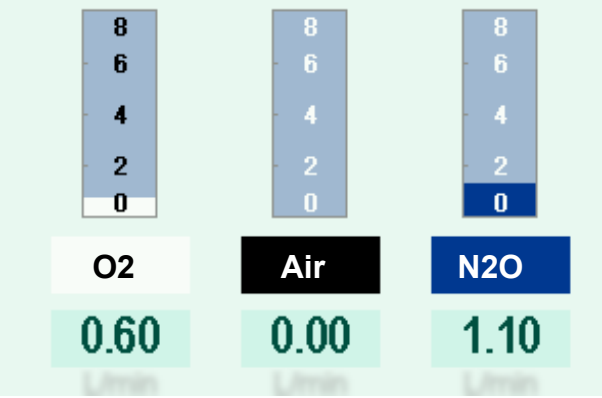
When the ***PV loop*** parameter field is displayed, the flow tubes will be displayed at reduced size:



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12 Troubleshooting

12.1 Leakage

Leakage may result in the system not being operational or being ready for operation with limitations only.

12.1.1 Possible causes of leakage

- The CO_2 absorber or the CLIC adapter is not securely screwed to the breathing system.
- The APL valve is not correctly fitted to the breathing system or is not set to 30 hPa (cmH_2O).
- The breathing bag, the breathing hoses, the Y-piece, or the bacteria filter is incorrectly fitted or damaged.
- The breathing bag arm (option) is incorrectly fitted to the breathing system. The sealing ring is soiled or damaged.
- The O-ring on the inspiratory port or expiratory port is damaged, soiled, or missing.
- The flow sensors are incorrectly installed or damaged. The rear O-ring is missing.
- The upper part of the breathing system is incorrectly fitted or damaged.
- The breathing system is not locked.
- The valves or seals of the breathing system are damaged.
- The sensor port for the O_2 sensor is not sealed with the sealing cap.
- The circuit plug is scratched or damaged.
- The filling or emptying connections on the vaporizer are leaking or are open. The vaporizer is incorrectly fitted. The O-ring is missing or damaged. The control dial is not set to the ***0*** position.

On devices with inspiratory O_2 measurement:

- The O_2 sensor is not correctly fitted in the breathing system.
- The O_2 sensor cell has not been correctly inserted in the sensor.

On devices with integrated patient-gas measurement module:

- The water trap is not connected.
- The sample line is not connected, is kinked, or is leaking.
- The connections for the sample line are damaged.

12.1.2 Systematic localization of leakage

To find causes for leakage, isolate individual components from the leakage test.

Component	Measure
Sample line	Remove the sample line and seal the Luer-Lock connector on the Y-piece.
Breathing hoses	Disconnect the breathing hoses. Connect the inspiratory port and expiratory port with a hose that is known to be without leakage. Connect the breathing bag directly to the breathing system.
Vaporizers	Remove the vaporizers.
O_2 sensor	Remove the O_2 sensor. Seal the sensor port with the sealing cap.

1. Perform the leakage test, see page 127.
2. Contact service personnel if the leakage cannot be localized.

12.1.3 Automatic leakage compensation

The device is able to compensate for small leakage.

– The pressure is held constant at the PEEP level.
– With pressure-controlled ventilation, the pressure is regulated according to the set pressure. Small leakage is compensated by the piston drive.

12.2 Power supply failure

12.2.1 Mains power supply failure

If mains power supply fails, the device automatically switches to the internal battery. A fully charged battery will maintain operation for at least 45 minutes. For further information see: "Technical data", page 267.

Remaining battery charge is displayed on the status display.

The breathing system warmer is deactivated during battery operation. The peak inspiratory flow may be limited to 75 L/minute.

12.2.2 Mains power supply failure and battery discharged

If mains power supply fails and the battery is discharged, a signal tone is emitted. Manual ventilation and spontaneous breathing are still available. O_2 and anesthetic agent can still be delivered using the emergency O_2 delivery (with electronically controlled gas mixer) or the flow control valves (with mechanically controlled gas mixer) and the vaporizers.

The following components and functions are not available:

– Ventilator
– Electronically controlled gas mixer
– Device monitoring and patient monitoring

⚠ WARNING
Risk of patient injury
If all power sources fail, the screen goes dark and mechanical ventilation ends.
► Ventilate the patient manually.

Further procedures:

1. Check the vaporizer setting.
2. Electronically controlled gas mixer:
   Use emergency O_2 delivery, see page 37

   Mechanically controlled gas mixer:
   Close the flow control valves for Air and N_2O. Use only O_2 as fresh gas.
3. Electronically controlled gas mixer:
   Monitor the O_2 flow with the O_2 flowmeter.

   Mechanically controlled gas mixer:
   Monitor the O_2 flow on the total flow tube.
4. Ventilate the patient manually.
5. Ensure corresponding substitute monitoring.

12.2.3 After power supply is restored

1. Restart the device, see page 86.
2. Charge the discharged battery for at least 8 hours.
3. Check the displays for mains power supply and battery on the status display.

12.3 Failure of the gas supply

A failure of the central supply can result in simultaneous device malfunctions on all systems connected to it.

The device generates alarms if the gas supply for the gases O_2, Air, or N_2O fail.

ℹ The alarm for N_2O is only generated if N_2O is configured accordingly.

► Open the corresponding gas cylinder valve.
► Re-establish the central supply.

The following applies only for the electronically controlled gas mixer:

If the central supply for a gas fails and there is no sufficiently filled gas cylinder connected (see "Gas mixing unit", page 29), the device automatically uses a substitute gas:

Failed gas	Substitute gas
O_2	100 % Air
N_2O	100 % O_2
Air	100 % O_2

The level of the fresh-gas flow is maintained.

12.3.1 Failure of one gas

Operation of fresh-gas delivery is still possible when supply of one gas fails. If, e.g., N_2O fails, proceed as follows:

Electronically controlled gas mixer:

► Switch to Air or O_2 as the carrier gas.

Mechanically controlled gas mixer:

► Open the appropriate flow control valve for the substitute gas.

12.3.2 Replacing an empty gas cylinder

1. Close the valve of the empty gas cylinder.
2. Completely use up or completely release any gas remaining in the pressure reducer and in the hose between the device and the gas cylinder.
   If there is no patient connected, venting can be performed as follows:
   – Disconnect the central O_2 supply.
   – Open the flow control valve of the O_2 flowmeter. Wait until gas is no longer flowing.
   – Close the flow control valve of the O_2 flowmeter again.
3. Unscrew the pressure reducer from the gas cylinder valve.
4. Replace the gas cylinder with a full gas cylinder.
5. Connect the pressure reducer to the new filled gas cylinder, see page 60.
6. Open the valve of the filled gas cylinder slowly.

12.3.3 Complete failure of the gas supply

⚠ WARNING
Risk of patient recovering consciousness
If the gas supply fails completely, further operation takes place through gas supply of the anesthesia machine with ambient air. The ventilation continues with the ambient air, however no more anesthetic agent or additional oxygen is delivered. The inspiratory anesthetic gas concentration and the inspiratory oxygen concentration in the breathing gas fall.

► Monitor the gas mixture carefully and use intravenous anesthetic agents if necessary.

If the central O_2 supply and the central Air supply fail at the same time and no gas cylinders are connected, the patient can nevertheless be mechanically ventilated. This is possible because the piston ventilator does not require a drive gas.

1. **⚠ CAUTION**
   Risk of increased anesthetic gas concentrations in the ambient air
   If the breathing bag is not connected, expiratory anesthetic gases may escape from the breathing system.
   ► Ensure adequate circulation of the ambient air.

   Remove the breathing bag.
2. Continue the mechanical ventilation.

When the breathing bag is removed, the missing fresh-gas volume will automatically be filled by ambient air. Nevertheless, the ***Fresh gas low or leakage*** alarm is likely to be triggered.

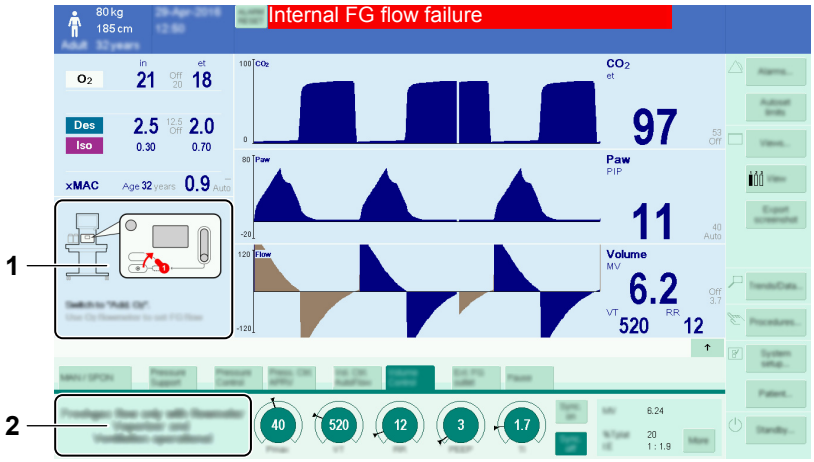
12.3.4 After the central supply is restored

1. Connect the compressed gas hoses to the terminal units.
2. Close the gas cylinder valve on the corresponding gas cylinder again.

On devices that are equipped with Advanced Cylinder Support, the gas cylinder valves can remain open.

12.4 Failure of fresh-gas delivery (electronically controlled gas mixture)

If the fresh-gas delivery has failed, the emergency O_2 delivery can be used to deliver oxygen and anesthetic agent. The current ventilation mode and the fresh-gas deficiency detection remain active.



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In the event of a fault, illustrations and instructions showing how to start the emergency O_2 delivery are displayed in areas (1) and (2).

The emergency O_2 delivery is started as follows:

⚠ WARNING
Risk of patient injury
If the gas mixer fails, no fresh gas is delivered.
► Check the vaporizer setting.
► Supply the patient with O_2.
► Use the emergency O_2 delivery.

1. Set the O_2 switch upwards to the ***Add. O_2*** position. (Follow the illustration on the screen.)
   The ***Internal FG flow failure*** alarm will then be automatically downgraded.
2. Open the flow control valve on the O_2 flowmeter. Set the desired flow. This O_2 flow flows through the vaporizer.

3. Check the vaporizer setting.
4. Continuously monitor the O_2 flow of the emergency delivery.

Take the following measures if necessary:

► Perform the ventilation with ambient air. For further information see: "Complete failure of the gas supply", page 193.

► Ventilate the patient with the manual resuscitator.

12.5 Failure of the piston ventilator

If the ventilator fails, only manual ventilation or spontaneous breathing remain possible. No other ventilation modes can be selected. The fresh-gas delivery remains ready for operation.

1. Switch to the ***Man/Spon*** ventilation mode.
2. Ventilate the patient manually.

12.6 Failure of the O_2 sensor

If the ***O_2 measurement not available*** alarm is displayed, the O_2 measurement has failed.

1. ⚠ **WARNING**
   Risk due to faulty O_2 sensor
   If the O_2 measurement fails, it will no longer be possible to monitor the patient adequately.
   ► Make sure that substitute O_2 monitoring conforming to the general safety requirements is available.

   Perform a system test and calibrate the O_2 sensor.
2. If the calibration fails and the ***O_2 sensor failure*** alarm is displayed, refer to the following table:

Cause	Remedy
During the calibration, the sensor was exposed to a gas mixture with a fluctuating O_2 concentration. The O_2 sensor was not correctly placed. The O_2 sensor was placed close to mobile radio equipment or similar sources.	During calibration: – Remove the sensor from the breathing system and place it on the work surface. – Do not fill vaporizers during the calibration. – Close the additional O_2 flow delivery for the fresh gas mixer. – Do not blow into the sensor. – Do not use any disinfectants. – Close off other gas sources in the vicinity of the sensor.

Cause	Remedy
The O_2 sensor cell is not present or is not plugged in correctly.	Check the O_2 sensor cell: – Insert the sensor cell if it is not present. – Check that the sensor cell is correctly seated. – Calibrate the sensor cell again. ℹ An initialization phase of up to 30 minutes is required after a new O_2 sensor cell is inserted. Only then is O_2 measurement and calibration possible once more.
The O_2 sensor cell is faulty or is expiring.	Replace the O_2 sensor cell.

12.6.1 Failure of the integrated patient-gas measurement module (PGM)

► ⚠ **WARNING**
Risk due to gas measurement failure
If the gas measurement fails, the patient can no longer be adequately monitored.
► Check the sample line and the water trap for damage or blockages. Pay attention to the replacement intervals.
► Replace the patient-gas measurement module.
► Ensure corresponding substitute monitoring.

Arrange for appropriate substitute monitoring conforming to ISO 80601-2-55.

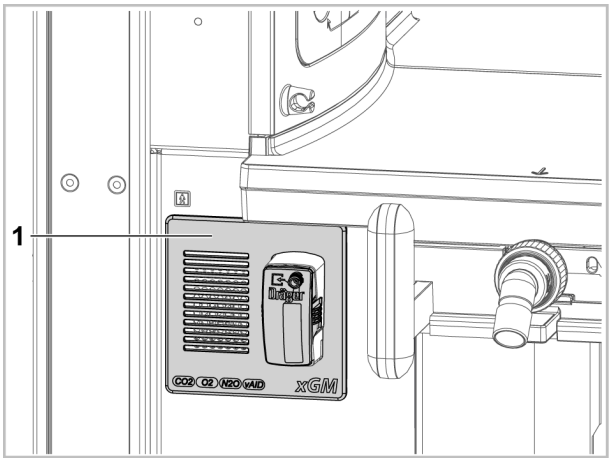
12.6.2 Replacing the patient-gas measurement module (PGM)

Contact service personnel to replace the PGM.

Prerequisite:
– There is no patient connected.
– The device is switched off.
– The device is disconnected from the power supply. To do this, disconnect the power plug.
– The water trap has been removed.

1. ⚠ **WARNING**
Incorrect gas measurement
Faulty or non-functional PGMs can cause incorrect gas measurements. As a result, the patient could be put at risk.
► Have the PGM replaced by service personnel.

At the left-hand side of the device, take hold of the cover (1) at the top and bottom and pull it off directly to the front.



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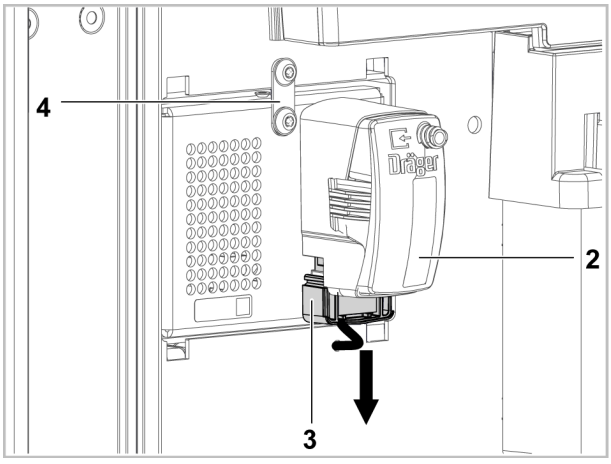
2. On the underside, remove the water trap (2) and the RFID antenna, if present. To do this, gently press the side surfaces (3) of the RFID antenna together. Pull the RFID antenna off downwards and leave it on the device.

ℹ Do not pull on the antenna cable. Do not kink the antenna cable.



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3. Remove the 2 screws and the fixing plate (4).
4. Withdraw the patient-gas measurement module from the compartment.
5. Fit a new patient-gas measurement module. Proceed in reverse order to do this.
6. Insert a new water trap.
7. Turn on the device.
8. Perform a software download for the new PGM if required.
9. Perform a system test.

12.7 Flow measurement failure

If the flow measurement fails, mechanical ventilation can still continue. There may be limitations with regard to displayed measured values, measurement accuracies, and when triggering mandatory breaths. The flow sensors can be replaced as soon as the device is in standby mode.

1. Remove the flow sensors, see page 239. Insert new flow sensors, see page 253.
2. Perform the leakage test, see page 127.

12.8 Screen fault or failure of the graphical user interface

The screen does not respond to operation. It has failed or the screen display is faulty.

1. Activate the backup manual switch, see page 38.
2. Use the emergency O_2 delivery, see page 37.
3. Check the vaporizer setting.
4. Ventilate the patient manually.
5. Ensure appropriate substitute monitoring.

12.9 Complete failure

The device no longer responds to user operation.

⚠ WARNING
Risk of device malfunction
If the breathing bag does not fill with fresh gas, the patient cannot be sufficiently ventilated.

► Check the oxygen supply. If necessary, open the gas cylinder valves.
► If fresh gas still is not delivered or manual ventilation is not possible, close the flow control valve of the O_2 flowmeter.
► Disconnect the patient from the device. Use a substitute device.

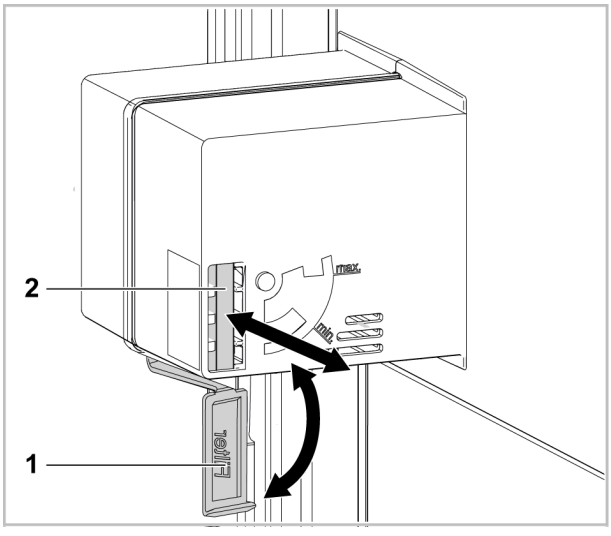
1. Activate the backup manual switch (see "Backup manual mode", page 38).
2. Follow the instructions on the product label.
3. If no ventilation of the patient is possible, use a manual resuscitator. Use a substitute device.

12.10 Problems with the active anesthetic gas receiving system (AGS)

Fault	Cause	Remedy
Flow indicator is below the restricted range.	The suction power of the ejector in the terminal unit of the anesthetic gas scavenging system (AGSS) is insufficient.	Have the function of the AGSS terminal unit checked. Follow the corresponding instructions for use.
	The particle filter is contaminated or blocked.	Replace the particle filter.
The flow indicator is above the normal range.	The suction power of the ejector in the AGSS terminal unit is too high.	Have the suction power of the ejector in the AGSS terminal unit adjusted to the working range of the AGS.
	The particle filter is missing.	If no soiling can be seen in the transparent housing of the AGS or on the flow indicator, insert the particle filter. If soiling can be seen in the transparent housing of the AGS or on the flow indicator, replace the AGS.

12.10.1 Replacing the particle filter of the active anesthetic gas receiving system (AGS)

1. Fold down the cover (1).



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2. Withdraw the particle filter (2).
3. Insert the cleaned or new particle filter.

4. ⚠ **CAUTION**
   Risk of contaminating the ambient air
   A filter cover that is not properly closed can cause contamination of the ambient air with anesthetic gases.
   ► Take care that the cover is properly closed.

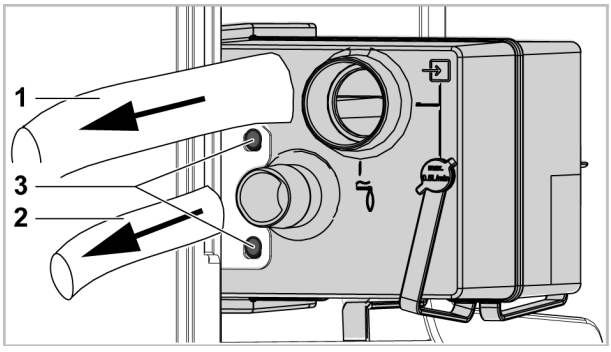
   Fold up the cover.

12.10.2 Replacing the anesthetic gas receiving system (AGS)

This chapter describes the replacement using the example of an active AGS which is connected to the device with the transfer hose and to the anesthetic gas scavenging system with the scavenging hose.

Disassembly

1. Disconnect the transfer hose (1).



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2. Disconnect the scavenging hose (2).
3. Unfasten the 2 screws (3).
4. Withdraw the AGS to the side.
5. Dispose of the AGS.

   ℹ The AGS must not be reprocessed.

Assembly

1. Slide in the new AGS.
2. Fasten the AGS with 2 screws.
3. Connect the scavenging hose.
4. Connect the transfer hose.

12.11 Cylinder pressure reducer

Fault	Cause	Remedy
The connection between the gas cylinder and the pressure reducer leaks.	The sealing ring is damaged.	Replace the sealing ring.
The outlet pressure rises, the release valve relieves the outlet of the pressure reducer.	The valve seat is soiled or damaged.	Close the gas cylinder valve. Have the item repaired by service personnel.
Leakage in the housing area	The diaphragm is faulty.	Have the item repaired by service personnel.

12.12 Support request

If the device is configured for remote maintenance, device information can be sent to Dräger in the event of a problem. Proceed as follows to send a support request to Dräger:

1. In the ***Standby*** mode, touch the ***Tests...*** button.
2. Touch the ***Request support*** button.

12.13 Alarm – Cause – Remedy

Alarm messages are displayed in hierarchal form in the alarm message field of the header bar, see page 154.

The priority of the alarm messages is indicated by different background colors.

In the ***Current alarms*** and ***Logbook*** tables, the priority of the alarm messages is also indicated by exclamation marks.

Alarm priority	Label	Priority number	Background color
High	!!!	0 - 255	Red
Medium	!!	0 - 255	Yellow
Low	!	0 - 255	Cyan

In order to classify alarms having the same alarm priority, internal priority numbers are given in the table below. The most critical alarm within an alarm priority is given the number 255.

The following table lists the alarm messages in alphabetical order. If an alarm occurs, the table helps to quickly identify causes and remedies. The possible causes and remedial measures should be looked through in the order they are listed until the alarm is resolved.

Some alarms are listed several times because their priority may change under certain conditions, see page 160.

ℹ Some alarms only occur if the corresponding option is installed.

Priority		Alarm	Cause	Remedy
!	100	Absorber disconnected?	Infinity ID CLIC absorber is not correctly connected.	Check absorber.
				Use "ALARM RESET" to acknowledge alarm.
!!	100	"Add. O_2" activated	O_2 switch is set to "Add. O_2".	Close the flow control valve of the O_2 flowmeter. Set the O_2 switch to "Aux. O_2".
				Use "ALARM RESET" to downgrade alarm priority.
!	255	Agent measurement failed	There is electromagnetic interference.	Check for electromagnetic radiation in the vicinity.
			There is an internal failure.	Use an alternative gas measurement system.
				If the problem persists, call Dräger.
!	255	Agent measurement not available	The ambient air used for calibrating the sensor was impure.	Position the device in an environment with clean ambient air.
				Wait for the automatic calibration.
			There are multiple anesthetic agents in the breathing gas.	Wait until anesthetic agent identification is complete.
			There is electromagnetic interference.	Check for electromagnetic radiation in the vicinity.
			Ambient temperature is too high.	Check ambient conditions.
!	255	Agent measurement temporarily inaccurate	The sensor has not yet warmed up.	Wait for the automatic calibration.
			The ambient air used for calibrating the sensor was impure.	Position the device in an environment with clean ambient air.
				Wait for the automatic calibration.
!	220	Air cylinder almost empty	The cylinder is almost empty.	Replace the cylinder. Use the central supply.
!	255	Air cylinder empty	The cylinder is empty or closed.	Replace the cylinder. Use the central supply.
!	190	Air cylinder sensor?	Cylinder pressure sensor is not connected.	Check if cylinder pressure sensor is connected.
				Use "ALARM RESET" to acknowledge alarm.
!!	150	Air FG flow measurement failed	The measurement system for the Air fresh-gas flow has failed.	Only use O_2 as fresh gas.
				Use the total flow tube to check the fresh-gas flow. Adjust the fresh-gas flow so that it equals or exceeds the minute volume.

Priority	Alarm	Cause	Remedy
!!! 110	Air supply low	Central supply pressure and cylinder pressure are low.	Check central Air supply or use cylinder.
			Use "ALARM RESET" to downgrade alarm priority.
!!! 255	Airway press. continuously high	Airway pressure has been continuously high.	Check spontaneous breathing ability of the patient.
			Check ventilation settings.
			Check breathing hoses, breathing system, and anesthetic gas scavenging system.
			In Man/Spon mode, check the APL valve setting.
			Check lower alarm limit for airway pressure.
!!! 255	Airway pressure high	The upper alarm limit for the airway pressure has been exceeded. The applied inspiratory pressure is higher than the set value.	Check patient condition.
			Check ventilation settings.
			Check alarm limit.
		Breathing hoses are blocked or the tube is kinked.	Check breathing circuit and tube.
!!! 255	Airway pressure negative	Fresh-gas flow is insufficient, breathing bag is blocked or positioned incorrectly.	Check fresh-gas settings and position of breathing bag.
		Suction maneuver during ventilation.	Check the bronchial suction system.
		Failure of the anesthetic gas scavenging system.	Check anesthetic gas scavenging system.
!! 90	Airway pressure not achieved	Fresh-gas flow is insufficient, breathing bag is blocked or positioned incorrectly.	Check fresh-gas settings and position of breathing bag.
		Leakage or disconnection.	Check the breathing circuit for tight connections and leakages.
! 100	Alarm silence key stuck	Key is stuck or was pressed for more than 10 seconds.	The therapy will continue with current settings.
			If the problem persists, call Dräger.
!!! 220	Apnea	No breathing or ventilation.	Start manual ventilation!
			Check ventilation settings.
			Check spontaneous breathing ability of the patient.

Priority	Alarm	Cause	Remedy
!! 255	Apnea	No breathing or ventilation.	Start manual ventilation!
			Check ventilation settings.
			Check spontaneous breathing ability of the patient.
!!! 220	Apnea (no CO_2)	No breathing or ventilation.	Start manual ventilation!
			Check ventilation settings.
			Check spontaneous breathing ability of the patient.
		Sample line is not connected.	Connect sample line to breathing circuit.
!! 255	Apnea (no CO_2)	No breathing or ventilation.	Start manual ventilation!
			Check ventilation settings.
			Check spontaneous breathing ability of the patient.
		Sample line is not connected.	Connect sample line to breathing circuit.
!!! 220	Apnea (no flow)	No breathing or ventilation.	Start manual ventilation!
			Check ventilation settings.
			Check spontaneous breathing ability of the patient.
		Fresh-gas flow is insufficient, breathing bag is blocked or positioned incorrectly.	Check fresh-gas settings and position of breathing bag.
		The breathing hoses are blocked or leaking.	Check breathing circuit and tube.
!! 255	Apnea (no flow)	No breathing or ventilation.	Start manual ventilation!
			Check ventilation settings.
			Check spontaneous breathing ability of the patient.
		Fresh-gas flow is insufficient, breathing bag is blocked or positioned incorrectly.	Check fresh-gas settings and position of breathing bag.
		The breathing hoses are blocked or leaking.	Check breathing circuit and tube.
!!! 220	Apnea (no pressure)	No breathing or ventilation.	Start manual ventilation!
			Check ventilation settings.
		Fresh-gas flow is insufficient, breathing bag is blocked or positioned incorrectly.	Check fresh-gas settings and position of breathing bag.
		The breathing hoses are blocked or leaking.	Check breathing circuit and tube.

Priority		Alarm	Cause	Remedy
!!	255	Apnea (no pressure)	No breathing or ventilation.	Start manual ventilation!
				Check ventilation settings.
			Fresh-gas flow is insufficient, breathing bag is blocked or positioned incorrectly.	Check fresh-gas settings and position of breathing bag.
			The breathing hoses are blocked or leaking.	Check breathing circuit and tube.
!!	90	Apnea Ventilation	No inspiratory effort of the patient detected.	Check spontaneous breathing ability of the patient.
				Adjust the setting for "Trigger".
				Change to pressure-controlled or volume-controlled ventilation mode.
				Use "ALARM RESET" to downgrade alarm priority.
!	0	Apnea Ventilation	No inspiratory effort of the patient detected.	Check spontaneous breathing ability of the patient.
				Adjust the setting for "Trigger".
				Change to pressure-controlled or volume-controlled ventilation mode.
!!!	100	Backup manual mode activated	The backup manual switch has been activated.	Start manual ventilation!
				Check vaporizer and fresh-gas settings.
				To exit backup manual mode, return the switch to its normal position.
!	100	Backup manual mode activated	The backup manual switch has been activated.	Start manual ventilation!
				Check vaporizer and fresh-gas settings.
				To exit backup manual mode, return the switch to its normal position.
!!	100	Backup speaker failure	The backup speaker for alarm tones is faulty.	Call Dräger.
				Use "ALARM RESET" to acknowledge alarm.
!	180	Battery charge low	The battery charge is low and the mains power supply is not available.	Restore mains power supply.
				The breathing system warmer has been switched off. Check the breathing circuit for condensate. Increase the fresh-gas flow if necessary.

Priority		Alarm	Cause	Remedy
!!	30	Battery charge very low	The battery charge is critical and the mains power supply is not available. The device will shut down in the next 5 minutes.	Make sure that the mains power supply is correctly connected.
				The breathing system warmer has been switched off. Check the breathing circuit for condensate. Increase the fresh-gas flow if necessary.
				Once the battery has been depleted, ventilate the patient manually.
!!	170	Battery failure	The battery is faulty. If the mains power supply fails, the device will switch off immediately.	Call Dräger.
!	100	Battery temperature high	The battery temperature is high. Charging of the battery has been suspended to protect it from damage.	Ensure that the system is connected to the mains power supply.
				Check the ambient temperature.
!	100	Breathing circuit expired	Accessory has been used too long.	Replace the accessory if necessary.
				Use "ALARM RESET" to acknowledge alarm.
!!!	120	Breathing system failure	The breathing system is not correctly assembled or installed.	Check patient condition.
				Check the breathing system.
				Verify that the sensor port for the O_2 sensor is sealed.
				Check if the piston diaphragm is correctly inserted.
				If the problem persists, replace the breathing system.
			The breathing system is faulty.	Replace the breathing system.
				If ventilation is impaired, use a manual resuscitator.

Priority		Alarm	Cause	Remedy
!!	255	Breathing system failure	The breathing system is not correctly assembled or installed.	Check patient condition.
				Check the breathing system.
				Verify that the sensor port for the O_2 sensor is sealed.
				Check if the piston diaphragm is correctly inserted.
				If the problem persists, replace the breathing system.
			The breathing system is faulty.	Replace the breathing system.
				If ventilation is impaired, use a manual resuscitator.
!!!	255	Breathing system temp. high?	The breathing system warmer is faulty.	Check the inspiratory breathing gas temperature as close to the Y-piece as possible.
				Remove breathing system cover.
				Use longer inspiratory hose.
				Open the system setup and turn off the breathing system warmer.
				If necessary, proceed as follows: -Turn off the device with the main switch, then ventilate the patient with the breathing bag. Or -Disconnect the patient, then use a manual resuscitator.
!	100	Breathing system warmer failure	The breathing system warmer is faulty.	Check breathing circuit for condensation. Increase fresh-gas flow if necessary.
				Call Dräger.
!!	100	Cardiac bypass mode still active?	A significant minute volume was measured during cardiac bypass mode.	Deactivate the cardiac bypass mode.
				Use "ALARM RESET" to downgrade alarm priority.
!	100	Central Air supply high	The central supply pressure is high. The gas delivery might fail.	Check central supply.
!	255	Central Air supply low	Central supply pressure is low.	Check central supply.
!	100	Central N_2O supply high	The central supply pressure is high. The gas delivery might fail.	Check central supply.
!	255	Central N_2O supply low	Central supply pressure is low.	Check central supply.

Priority		Alarm	Cause	Remedy
!	100	Central O_2 supply high	The central supply pressure is high. The gas delivery might fail.	Check central supply.
!!!	210	Central O_2 supply low	Central supply pressure is low.	Check central O_2 supply or use cylinder.
				Use "ALARM RESET" to downgrade alarm priority.
!	255	Central O_2 supply low	Central supply pressure is low.	Check central supply.
!	100	CO_2 absorber expired	Accessory has been used too long.	Replace the accessory if necessary.
				Use "ALARM RESET" to acknowledge alarm.
!	255	CO_2 measurement failed	There is electromagnetic interference.	Check for electromagnetic radiation in the vicinity.
			There is an internal failure.	Use an alternative gas measurement system.
				If the problem persists, call Dräger.
!	255	CO_2 sensor accuracy low	The sensor has not yet warmed up.	Wait for the automatic calibration.
			The ambient air used for calibrating the sensor was impure.	Position the device in an environment with clean ambient air.
!	0	Communication failure	The network connection could not be established.	Re-establish the connection.
				Use "ALARM RESET" to acknowledge alarm.
				Check the connections from/to Connectivity Converter CC300.
			A network certificate has expired or Connectivity Converter CC300 is faulty.	Call Dräger.
			In the network, there is another anesthesia machine with the same integrated system ID.	Check the integrated system ID.
!!	135	Cooling fan failure	An internal fan for evacuating gases is faulty.	To prevent potential damage, turn off the device at your earliest convenience. Increased risk of fire.
				Call Dräger.

Priority		Alarm	Cause	Remedy
!!	150	Emergency air inlet activated	There was not enough gas to ventilate the patient. To maintain a minimum ventilation, the device has started to use ambient air.	Refill the breathing bag, e.g., with O_2 flush.
				Increase fresh-gas flow.
				Check the breathing circuit for tight connections and leakages.
			An external anesthetic gas monitor is extracting gas from the breathing system via a sample line.	Disconnect the sample line. Seal the sample line port.
!!	135	$etCO_2$ high	$etCO_2$ has exceeded the upper alarm limit.	Check ventilation.
!!	135	$etCO_2$ low	$etCO_2$ is below the lower alarm limit.	Check ventilation.
!!	100	Exp. pressure sensor failure	Sensor calibration failed.	Ensure that a suitable substitute monitoring is available.
				Perform the system test.
				If the problem persists, call Dräger.
!	100	Expiratory flow sensor expired	Accessory has been used too long.	Replace the accessory if necessary.
				Use "ALARM RESET" to acknowledge alarm.
!	255	Expiratory flow sensor failure	The sensor is not calibrated. The breathing system has been replaced or disconnected since last calibration.	Perform the leakage test.
			Failure of the flow sensor.	Replace the flow sensor and perform a leakage test.
!!!	200	External fresh-gas outlet failure?	The internal fresh-gas valve is faulty. It is unclear whether the fresh gas is being fed into the internal breathing system or towards the external fresh-gas outlet.	Use "O_2+" button to determine flow direction of fresh gas: -If internal breathing system or breathing bag fill, external fresh-gas outlet is not available. -If gas flows out of the external fresh-gas outlet, external fresh-gas outlet can be used. Internal breathing system can only be used when the breathing bag is not connected (ventilation with ambient air only).
				Check fresh-gas settings.
				If the problem persists, call Dräger.

Priority		Alarm	Cause	Remedy
!	100	External fresh-gas outlet not available	The external fresh-gas outlet is faulty.	Ventilate the patient via the internal breathing system.
				Perform the system test.
				If the problem persists, call Dräger.
!!	10	FiO_2 high	FiO_2 has exceeded the upper alarm limit for 2 consecutive breaths and for more than 15 seconds.	Check O_2 concentration and fresh-gas settings.
!!	10	FiO_2 high	FiO_2 has exceeded the upper alarm limit.	Check O_2 concentration and fresh-gas settings.
!!!	255	FiO_2 low	FiO_2 has fallen below the lower alarm limit for 2 consecutive breaths and for more than 15 seconds.	Check O_2 concentration and fresh-gas settings.
				Check the breathing system for high leakage.
				Check O_2 supply.
!!!	255	FiO_2 low	FiO_2 has fallen below the lower alarm limit.	Check O_2 concentration and fresh-gas settings.
				Check the breathing system for high leakage.
				Check O_2 supply.
!!	135	FiO_2 too high for neonates	FiO_2 has exceeded the threshold value for longer than the time configured in the system setup.	Check O_2 concentration and fresh-gas settings.
				Use "ALARM RESET" to acknowledge alarm.
!!	30	Flow control valve is open	At least one flow control valve is open.	Close all flow control valves.
!	80	Flow sensor calibration required	The flow sensor calibration is invalid.	Perform the leakage test.
!!!	100	Fresh gas low or leakage	Fresh-gas flow is insufficient, breathing bag is blocked or positioned incorrectly.	Refill the breathing system immediately, e.g., with O_2 flush.
				Check fresh-gas settings and position of breathing bag.
			Leakage or disconnection.	Check the breathing circuit for tight connections and leakages.
				Check tube or mask.
!!	155	Fresh gas low or leakage	Fresh-gas flow is insufficient, breathing bag is blocked or positioned incorrectly.	Check fresh-gas settings and position of breathing bag.
			Leakage or disconnection.	Check the breathing circuit for tight connections and leakages.
				Check tube or mask.
				Use "ALARM RESET" to downgrade alarm priority.

Priority		Alarm	Cause	Remedy
!!	100	Fresh-gas flow high	The total fresh-gas flow is greater than 15 L/min.	Reduce fresh-gas flow.
!!	60	Fresh-gas flow inaccurate	The delivered fresh-gas flow differs from the set fresh-gas flow.	Make sure that sufficient fresh-gas and anesthetic agent are delivered.
				Check the measured gas concentrations.
				Use "ALARM RESET" to downgrade alarm priority.
!!	50	Fresh-gas flow inaccurate	The accuracy of the fresh-gas flow measurement is reduced.	Use the total flow tube to verify the current fresh-gas flow.
				Check the measured gas concentrations.
				Use "ALARM RESET" to downgrade alarm priority.
				Perform the system test.
				If the problem persists, call Dräger.
!!	255	Gas sensor failure	The patient-gas measurement module has failed.	Use an alternative gas measurement system.
				Use "ALARM RESET" to downgrade alarm priority.
				Call Dräger.
!!	255	Hose connected to wrong port	A breathing hose is not correctly connected.	Connect breathing hoses correctly.
!!	100	Hose does not fit to pat. category	The detected breathing hose is not suitable for the selected patient category.	Use compatible accessory.
				Use "ALARM RESET" to acknowledge alarm.
!	100	Hose does not fit to pat. category	The detected breathing hose is not suitable for the selected patient category.	Use compatible accessory.
				Use "ALARM RESET" to acknowledge alarm.
!!	150	inCO_2 high	Soda lime is depleted.	Check soda lime.
				Increase fresh-gas flow.
				Check fresh-gas settings.
			There is leakage in the breathing system or in the coaxial breathing hose.	Replace the breathing system or the coaxial breathing hose.
			Gas measurement is inaccurate due to high respiratory rate.	Adjust alarm limits if necessary.
			Large dead space.	Check the ventilation settings and the breathing circuit.
!	100	Infinity ID breathing circuit not compatible	An incompatible accessory is connected.	Check accessory.
				Use "ALARM RESET" to acknowledge alarm.

Priority		Alarm	Cause	Remedy
!	100	Infinity ID CO_2 absorber not compatible	An incompatible accessory is connected.	Check accessory.
				Use "ALARM RESET" to acknowledge alarm.
!	100	Infinity ID water trap not compatible	An incompatible accessory is connected.	Check accessory.
				Use "ALARM RESET" to acknowledge alarm.
!!!	255	Inspiratory desflurane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
!!	255	Inspiratory desflurane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
!	255	Inspiratory desflurane low	The inspiratory anesthetic gas concentration is below the lower alarm limit.	Check vaporizer and fresh-gas settings.
				Refill the vaporizer.
				Check the breathing system for high leakage.
			The soda lime has dried out.	Replace the soda lime.
!!!	255	Inspiratory enflurane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
!!	255	Inspiratory enflurane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
!	255	Inspiratory enflurane low	The inspiratory anesthetic gas concentration is below the lower alarm limit.	Check vaporizer and fresh-gas settings.
				Refill the vaporizer.
				Check the breathing system for high leakage.
			The soda lime has dried out.	Replace the soda lime.
!	100	Inspiratory flow sensor expired	Accessory has been used too long.	Replace the accessory if necessary.
				Use "ALARM RESET" to acknowledge alarm.
!	255	Inspiratory flow sensor failure	The sensor is not calibrated. The breathing system has been replaced or disconnected since last calibration.	Perform the leakage test.
			Failure of the flow sensor.	Replace the flow sensor and perform a leakage test.
!!!	255	Inspiratory halothane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
!!	255	Inspiratory halothane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.

Priority	Alarm	Cause	Remedy
! 255	Inspiratory halothane low	The inspiratory anesthetic gas concentration is below the lower alarm limit.	Check vaporizer and fresh-gas settings.
			Refill the vaporizer.
			Check the breathing system for high leakage.
		The soda lime has dried out.	Replace the soda lime.
!!! 255	Inspiratory isoflurane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
!! 255	Inspiratory isoflurane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
! 255	Inspiratory isoflurane low	The inspiratory anesthetic gas concentration is below the lower alarm limit.	Check vaporizer and fresh-gas settings.
			Refill the vaporizer.
			Check the breathing system for high leakage.
		The soda lime has dried out.	Replace the soda lime.
!! 10	Inspiratory N_2O high	Inspiratory N_2O exceeds 82 %.	Check fresh-gas composition.
			Press the O_2+ button to flush the breathing system.
! 255	Inspiratory O_2 measurement temporarily inaccurate	The O_2 measurement accuracy is currently reduced.	Perform the system test.
!!! 255	Inspiratory sevoflurane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
!! 255	Inspiratory sevoflurane high	Inspiratory anesthetic gas concentration has exceeded the upper alarm limit.	Check vaporizer and fresh-gas settings.
! 255	Inspiratory sevoflurane low	The inspiratory anesthetic gas concentration is below the lower alarm limit.	Check vaporizer and fresh-gas settings.
			Refill the vaporizer.
			Check the breathing system for high leakage.
		The soda lime has dried out.	Replace the soda lime.
!!! 255	Inspiratory xMAC high	The inspiratory anesthetic gas concentration has exceeded 3 xMAC for more than 30 seconds. The expiratory anesthetic gas concentration has exceeded 2.5 xMAC for more than 30 seconds.	Check vaporizer and fresh-gas settings.
		The inspiratory anesthetic gas concentration has exceeded 5 xMAC.	Check vaporizer and fresh-gas settings.

Priority		Alarm	Cause	Remedy
!!	255	Inspiratory xMAC high	The inspiratory anesthetic gas concentration has exceeded 3 xMAC for more than 180 seconds.	Check vaporizer and fresh-gas settings.
!!	100	Internal device temperature high	A ventilation slot at the rear of the device is blocked.	Check the ventilation slots. Ensure air flow at the rear of the device.
			Ambient temperature is too high.	Check ambient conditions.
			A fan is faulty.	Call Dräger.
			Excessive ventilation settings are applied (e.g., high respiratory rate, high inspiratory pressure, short slopes).	Check ventilation settings.
!	255	Internal device temperature high	A ventilation slot at the rear of the device is blocked.	Check the ventilation slots. Ensure air flow at the rear of the device.
			Ambient temperature is too high.	Check ambient conditions.
			Excessive ventilation settings are applied (e.g., high respiratory rate, high inspiratory pressure, short slopes).	Check ventilation settings.
			A fan is faulty.	Call Dräger.
!!!	150	Internal FG flow failure	The internal gas delivery system is not operational. A system test may be able to resolve the issue.	Deliver O_2: 1. Set the O_2 switch to "Add. O_2". 2. Set the O_2 flowmeter to the desired flow. Check the vaporizer setting. Make sure that fresh gas is reaching the patient.
				When the case has been completed, perform a system test.
				If the problem persists, call Dräger.
!	150	Internal FG flow failure	The internal gas delivery system is not operational. A system test may be able to resolve the issue.	Set the O_2 flowmeter to the desired flow. Check the vaporizer setting. Make sure that fresh gas is reaching the patient.
				When the case has been completed, perform a system test.
				If the problem persists, call Dräger.
!	60	License expired	A license has expired. After next startup, some functions will no longer be available.	To order a permanent license, call Dräger.

Priority		Alarm	Cause	Remedy
!	50	License will expire soon	A trial license will expire within the next 14 days.	Use "ALARM RESET" to acknowledge alarm.
				To order a permanent license, call Dräger.
!!!	0	Loss of data	An internal memory failure has occurred. System data and system settings are lost.	Check current settings and default settings.
				Call Dräger.
!	50	Maintenance will be due soon	Maintenance will be due within the next 30 days.	Call Dräger.
				Use "ALARM RESET" to acknowledge alarm.
!	255	Measured gas concentrations out of range	The measured values are out of the measurement range.	Check patient condition.
				Check the vaporizer setting and the fresh-gas settings.
				Use an alternative gas measurement system.
				Perform the system test.
!	255	Measured gas concentrations temporarily inaccurate	The sensor has not yet warmed up.	Wait for the automatic calibration.
			The ambient air used for calibrating the sensor was impure.	Position the device in an environment with clean ambient air.
				Wait for the automatic calibration.
!	0	MEDIBUS COM 1 failure	Communication via the corresponding COM port is interrupted.	Re-establish the connection.
				Use "ALARM RESET" to acknowledge alarm.
			The configured baud rate is not sufficient for the amount of data to be transferred.	Increase the baud rate. Check the configuration of the external device.
!	0	MEDIBUS COM 2 failure	Communication via the corresponding COM port is interrupted.	Re-establish the connection.
				Use "ALARM RESET" to acknowledge alarm.
			The configured baud rate is not sufficient for the amount of data to be transferred.	Increase the baud rate. Check the configuration of the external device.
!!	30	Minute volume high	Upper alarm limit for the minute volume has been exceeded.	Check spontaneous breathing.
				Check ventilation settings (e.g., VT, Pinsp, RR).
				In PSV mode, correct the trigger threshold if necessary.
				Check alarm limit.
			Flow measurement is inaccurate.	Replace the expiratory flow sensor. Perform the leakage test.

Priority		Alarm	Cause	Remedy
!!	80	Minute volume low	The minute volume is below the lower alarm limit.	Check patient condition.
				Check ventilation settings.
				Check tube or mask.
				Check alarm limit.
			Flow measurement is inaccurate.	Replace the expiratory flow sensor. Perform the leakage test.
!	220	N_2O cylinder almost empty	The cylinder is almost empty.	Replace the cylinder. Use the central supply.
!	255	N_2O cylinder empty	The cylinder is empty or closed.	Replace the cylinder. Use the central supply.
!	190	N_2O cylinder sensor?	Cylinder pressure sensor is not connected.	Check if cylinder pressure sensor is connected.
				Use "ALARM RESET" to acknowledge alarm.
!!	150	N_2O FG flow measurem. failed	The measurement system for the N_2O fresh-gas flow has failed.	Only use O_2 as fresh gas.
				Use the total flow tube to check the fresh-gas flow. Adjust the fresh-gas flow so that it equals or exceeds the minute volume.
!	255	N_2O measurement failed	There is electromagnetic interference.	Check for electromagnetic radiation in the vicinity.
			There is an internal failure.	Use an alternative gas measurement system.
				If the problem persists, call Dräger.
!	255	N_2O measurement not available	The ambient air used for calibrating the sensor was impure.	Position the device in an environment with clean ambient air.
				Wait for the automatic calibration.
			There is electromagnetic interference.	Check for electromagnetic radiation in the vicinity.
			Ambient temperature is too high.	Check ambient conditions.
!	255	N_2O measurement temporarily inaccurate	The sensor has not yet warmed up.	Wait for the automatic calibration.
			The ambient air used for calibrating the sensor was impure.	Position the device in an environment with clean ambient air.
				Wait for the automatic calibration.
!!!	110	N_2O supply low	Central supply pressure and cylinder pressure are low.	Check central N_2O supply or use cylinder.
				Use "ALARM RESET" to downgrade alarm priority.

Priority	Alarm	Cause	Remedy
!!! 110	No Air delivery	Air is not available. Gas mixer is using 100 % O_2 instead.	Check central Air supply or use cylinder.
			Use "ALARM RESET" to downgrade alarm priority.
! 255	No CO_2 detected	Ventilation was started, but no exhaled CO_2 was detected for more than 60 seconds.	Check patient condition.
			Check sample line, water trap, and patient-side filter.
			Use "ALARM RESET" to acknowledge alarm.
!!! 200	No fresh-gas flow	No fresh-gas flow is set.	Open the flow control valves.
			Use "ALARM RESET" to downgrade alarm priority.
!!! 110	No N_2O delivery	N_2O is not available. Gas mixer is using O_2 instead.	Check central N_2O supply or use cylinder.
			Use "ALARM RESET" to downgrade alarm priority.
!!! 210	No O_2 delivery	O_2 is not available. Gas mixer is using Air instead.	Check central O_2 supply or use cylinder.
			Use "ALARM RESET" to downgrade alarm priority.
! 255	O_2 concentration implausibly high	The O_2 sensor calibration is invalid.	Use substitute O_2 monitoring.
			Perform the system test.
! 220	O_2 cylinder almost empty	The cylinder is almost empty.	Replace the cylinder. Use the central supply.
!!! 210	O_2 cylinder empty	The cylinder is empty or closed.	Replace the cylinder. Use the central supply.
			Use "ALARM RESET" to downgrade alarm priority.
! 255	O_2 cylinder empty	The cylinder is empty or closed.	Replace the cylinder. Use the central supply.
! 190	O_2 cylinder sensor?	Cylinder pressure sensor is not connected.	Check if cylinder pressure sensor is connected.
			Use "ALARM RESET" to acknowledge alarm.
!! 150	O_2 FG flow measurement failed	The measurement system for the O_2 fresh-gas flow has failed.	Only use O_2 as fresh gas.
			Use the total flow tube to check the fresh-gas flow. Adjust the fresh-gas flow so that it equals or exceeds the minute volume.

Priority		Alarm	Cause	Remedy
!!	255	O_2 measurement not available	The ambient air used for calibrating the sensor was impure.	Position the device in an environment with clean ambient air.
				Wait for the automatic calibration.
			There is electromagnetic interference.	Check for electromagnetic radiation in the vicinity.
			Ambient temperature is too high.	Check ambient conditions.
!	255	O_2 measurement temporarily inaccurate	The sensor has not yet warmed up.	Wait for the automatic calibration.
			The ambient air used for calibrating the sensor was impure.	Position the device in an environment with clean ambient air.
				Wait for the automatic calibration.
!!	255	O_2 sensor failure	The O_2 sensor in the patient-gas measurement module is faulty.	Use substitute O_2 monitoring.
				Use "ALARM RESET" to downgrade alarm priority.
				Perform the system test.
				Call Dräger.
!!	255	O_2 sensor failure	The O_2 sensor is faulty.	Use substitute O_2 monitoring.
				Use "ALARM RESET" to downgrade alarm priority.
				When the case has been completed, perform a system test.
				Replace the sensor cell if necessary.
				If the problem persists, call Dräger.
!!	255	O_2 sensor not ready	A new O_2 sensor cell was inserted.	Wait for the O_2 sensor to warm up.
				Perform a system test and calibrate the O_2 sensor.
				Use "ALARM RESET" to downgrade alarm priority.
			The O_2 sensor calibration is invalid.	Perform a system test and calibrate the O_2 sensor.
!!!	210	O_2 supply low	Central supply pressure and cylinder pressure are low.	Check central O_2 supply or use cylinder.
				Use "ALARM RESET" to downgrade alarm priority.
!	100	On/Standby key stuck	Key is stuck or was pressed for more than 10 seconds.	The therapy will continue with current settings.
				If the problem persists, call Dräger.

Priority	Alarm	Cause	Remedy
!!! 230	Pause time expired	Ventilation and gas delivery have been paused longer than the set pause time.	Resume ventilation or adjust timer.
			Use "ALARM RESET" to acknowledge alarm.
!! 230	Pause time expired	Ventilation and gas delivery have been paused longer than the set pause time.	Resume ventilation or adjust timer.
			Use "ALARM RESET" to acknowledge alarm.
! 100	Pause time expired	Ventilation and gas delivery have been paused longer than the set pause time.	Resume ventilation or adjust timer.
			Use "ALARM RESET" to acknowledge alarm.
!! 50	PEEP/CPAP high	The expiratory limb is blocked.	Check expiratory breathing hose and breathing system.
			Perform the leakage test.
		The anesthetic gas scavenging system is blocked.	Check anesthetic gas scavenging system.
! 170	Power failure	Mains power supply is not available. The device has switched to battery operation.	Restore mains power supply.
!! 100	Power supply failure	Internal fault in the power supply.	Operation of the device can be continued.
			Call Dräger.
!! 100	Pressure sensor failure	There is condensate in the breathing hoses.	Check the breathing hoses.
		Sensor calibration failed.	Perform the system test.
			If the problem persists, call Dräger.
! 255	Pressure-relief valve opened	The internal pressure-relief valve has been activated due to overpressure.	Check APL valve and fresh-gas settings.
!!! 200	Rotary knob stuck	Key is stuck or was pressed for more than 10 seconds.	The therapy will continue with current settings.
			Press and turn the rotary knob repeatedly.
			If necessary, proceed as follows: -Activate the backup manual mode, then ventilate the patient with the breathing bag. Or -Disconnect the patient, then use a manual resuscitator.
! 170	Sample line disconnected?	The sample line or the water trap has been disconnected.	Check sample line and water trap.
! 170	Sample line occluded	Sample line is occluded.	Check sample line, water trap, and patient-side filter.

Priority		Alarm	Cause	Remedy
!	75	Second agent detected	A second anesthetic agent has been detected.	Flush the system if necessary.
				Check fresh-gas settings.
				Wait for transition phase to end.
!	60	Service date reached	Maintenance is due.	Use "ALARM RESET" to acknowledge alarm.
				Call Dräger.
!!!	200	Set O_2 switch to "Add. O_2"	The internal gas delivery system has failed and the O_2 switch is still set to "Aux. O_2".	Set the O_2 switch to "Add. O_2". Set the O_2 flowmeter to the desired flow.
!!	0	Speaker failure	The loudspeaker is faulty.	Call Dräger.
				Use "ALARM RESET" to downgrade alarm priority.
!!!	100	System failure	The gas delivery and the controlled ventilation have failed due to an internal fault.	Proceed as follows: -Activate the backup manual mode, then ventilate the patient with the breathing bag. Or -Disconnect the patient, then use a manual resuscitator.
				Call Dräger.
!!!	0	Therapy settings not applied	The last changes to the therapy settings were not applied.	Change to Man/Spon mode, then switch back to the desired ventilation mode.
				Use "ALARM RESET" to acknowledge alarm.
				If the problem persists, call Dräger.
!!	100	Third agent detected	A mixture of more than 2 anesthetic agents has been detected.	Flush the system if necessary.
				Check fresh-gas settings.
				Wait for transition phase to end.
			There is electromagnetic interference.	Check for electromagnetic radiation in the vicinity.
!!	90	Tidal volume not achieved	The delivered inspiratory tidal volume is lower than the set value.	Check ventilation settings.
				Check Pmax setting.
				Check patient compliance. Check if the patient is breathing spontaneously.
!	0	USB write error	The USB flash drive is full, faulty, write-protected, or not compatible. The USB flash drive is not correctly connected. The USB flash drive is not correctly formatted.	Check the USB flash drive.
				Use "ALARM RESET" to acknowledge alarm.

Priority		Alarm	Cause	Remedy
!!!	120	Ventilator failure	The piston ventilator or at least one pressure sensor is faulty.	Start manual ventilation!
				When the case has been completed, perform a system test.
				If the problem persists, call Dräger.
!	100	Water trap disconnected?	Infinity ID water trap is not correctly connected.	Check water trap.
!	100	Water trap expired	Accessory has been used too long.	Replace the accessory if necessary.
				Use "ALARM RESET" to acknowledge alarm.
!	170	Water trap full	The water trap of the gas measurement is full.	Check water trap.
			Sample line is occluded.	Check sample line, water trap, and patient-side filter.
!!!	255	Wrong patient connection?	The patient is connected to the internal breathing system, but there is no oxygen delivery.	Change to Man/Spon mode and ventilate the patient manually.
			Breathing activity has been detected at an inactive breathing system.	Check if the patient is connected to the correct breathing system.
!!	80	xMAC low	Inspiratory and expiratory gas concentrations are lower than the automatically calculated limit.	Check patient condition.
				Check filling level. Refill if necessary.
				Check vaporizer setting.
				Check the breathing system and the breathing bag for leakages.
				If the current xMAC is acceptable, use "ALARM RESET" to acknowledge the alarm.
!	170	xMAC low	Inspiratory and expiratory gas concentrations are lower than the automatically calculated limit.	Check patient condition.
				Check filling level. Refill if necessary.
				Check vaporizer setting.
				Check the breathing system and the breathing bag for leakages.
				If the current xMAC is acceptable, use "ALARM RESET" to acknowledge the alarm.

13 Reprocessing

13.1 Safety instructions

Reusable products

Reusable products must be reprocessed, otherwise there is an increased risk of infection.

- ► Follow the infection prevention policies and reprocessing regulations of the health-care facility.
- ► Follow the national infection prevention policies and reprocessing regulations.
- ► Use validated procedures for reprocessing.
- ► Reprocess reusable products after every use.
- ► Follow the manufacturer's instructions for cleaning agents, disinfectants, and reprocessing devices.

Signs of wear, e.g., cracks, deformation, discoloration, or peeling, may occur with reprocessed products.

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

Disposable products

Disposable products such as, e.g., the sample line and the water trap, have been designed, tested, and manufactured exclusively for single use. Reuse, reprocessing, or sterilization can result in failure of the accessory, incorrect measurements, and injury to the patient.

- ► Do not reuse disposable products.
- ► Do not reprocess disposable products.
- ► Do not use any disinfectants.
- ► Do not reprocess with elevated pressure from syringes or compressed air.

Risk of infection

The breathing system may be contaminated with infectious agents. The following causes may be present:

- – No bacteria filters have been used at the Y-piece or at the expiratory port.
- – The breathing system is being used for the first time.

Perform the following measures:

- ► Use a reprocessed breathing system.
- ► Reprocess the breathing system if necessary.
- ► To prevent future contamination, use patient-side bacteria filters.

Flow sensors

High temperatures arise in the flow sensors, for example, in operation or while calibrating during a system test. Due to the high temperatures, residual vapors of flammable disinfectants (e.g., alcohols) and residues that were not removed during reprocessing may ignite. As a result, user and patient could be put at risk.

- ► Ensure particle-free cleaning and disinfection.
- ► After disinfection, allow the flow sensor to air for at least 30 minutes.
- ► Before inserting the flow sensor, check for visible damage and soiling, such as residual mucus, medication aerosols, and particles.
- ► Replace flow sensors when damaged, soiled, or not particle-free.

Incorrect reprocessing or soiling, e.g., residues or particles, can damage the flow sensor. As a result, the patient could be put at risk.

- ► Do not use machine disinfection or cleaning
- ► Do not use plasma sterilization or radiation sterilization
- ► Do not use water jets, compressed air, brushes, or similar
- ► Do not use ultrasonic baths
- ► Do not use hot steam sterilization on the Spirolog and Infinity ID flow sensors
- ► Clean and disinfect the flow sensor in accordance with the associated instructions for use.
- ► Use only clean disinfectant solutions to disinfect the flow sensor.

13.2 Information on reprocessing

Instructions for reprocessing are based on internationally accepted guidelines, e.g., standard ISO 17664.

- ► Follow the information on reprocessing attached parts, accessories, and consumables in the associated instructions for use.
- ► Clean and disinfect the anesthesia workstation according to the infection prevention policy of the hospital.
- ► The use of low-quality soda lime with a high proportion of limestone fragments and dust can cause increased accumulation of soda lime residues in the breathing system. Check the breathing system for residues at regular intervals, e.g., every 4 weeks, and perform the reprocessing more frequently if necessary.

13.3 Classifications for reprocessing

13.3.1 Classification of medical devices

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

Classification	Explanation	Reprocessing
Non-critical	Components that come only into contact with skin that is intact	Surface disinfection with cleaning (see page 229)
Semi-critical	Components that carry breathing gas or come into contact with mucous membranes or pathologically altered skin	Machine cleaning with thermal disinfection (see page 242)
Critical	Components that penetrate skin or mucous membranes or come into contact with blood	Machine cleaning with thermal disinfection followed by sterilization

13.3.2 Classification of device-specific components

Follow the instructions for use for the components.

The following classification is a recommendation from Dräger.

Non-critical

– Device surfaces

Semi-critical

– Breathing system:
  – Upper part of the breathing system, lower part of the breathing system
  – Nozzles, flow sensors, APL valve
  – Non-return valves (yellow and blue)
  – Fresh-gas decoupling valve (black)
  – Sensor cap of the O_2 sensor
  – Bag elbow
– Absorber container and absorber insert
– Piston diaphragm
– Breathing bag arm (option)
– CLIC adapter (option)

Critical

The device does not contain any components that are classified as critical.

13.4 Reprocessing list

The following summary provides an overview of the reprocessing procedures defined for each device component. For further information on the defined reprocessing procedures, see chapters "Surface disinfection with cleaning" and "Machine cleaning with thermal disinfection".

Components	Surface disinfection with cleaning	Machine cleaning with thermal disinfection
Device surfaces	Yes	No
Breathing system mount[1)]	Yes	No
Ports	No	Yes
Non-return valves (yellow, blue, and black)	No	Yes
APL valve	Yes (exterior)	Yes
Upper part of the breathing system and lower part of the breathing system	No	Yes
Sensor cap of the O_2 sensor[2)]	No	Yes
Absorber container and absorber insert	No	Yes
Piston diaphragm	No	Yes
Breathing bag arm (option)	Yes	Yes
CLIC adapter (option)	Yes	Yes

1) Special reprocessing measure, see page 236.
2) Special reprocessing measures, see page 245.

13.5 Reprocessing procedures

13.5.1 Validated reprocessing procedures

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

Procedure	Agent	Manufacturer	Concentration	Contact time	Temperature
Surface disinfection with cleaning	Dismozon plus	BODE Chemie	1.6 %	15 min	–
	Mikrobac[1)]	BODE Chemie	–	1 min	–
	Oxycide	Ecolab USA	2.34 %	5 min	–
Machine cleaning	Neodisher Mediclean forte	Dr. Weigert	0.3 %	10 min	55 °C (131 °F)
Machine disinfection (thermal)	–	–	–	5 min	90 °C (194 °F)

1) For temperature measurement nozzles and pneumatic connections in the breathing system mount (see "Disinfecting the breathing system mount", page 236)

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

13.5.2 Disinfectants

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

13.5.2.1 Surface disinfectants

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

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

– Bactericidal
– Yeasticidal
– Virucidal or virucidal against enveloped viruses

Follow the manufacturer's instructions for the surface disinfectants.

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

Do not use purely alcohol-based disinfectants.

Disinfectants based on alcohol or with a high alcohol concentration have only limited effectiveness and may cause property damage.

Class of active ingredient	Surface disinfectants	Manufacturer
Chlorine-releasing agents	Actichlor plus	Ecolab
	BruTab 6S	Brulin
	Clorox Professional Disinfecting Bleach Cleaner	Clorox
	Dispatch Hospital Cleaner Disinfectant Towels with Bleach	
	Klorsept 17	Medentech
Oxygen-releasing agents	Descogen Liquid	Antiseptica
	Descogen Liquid r.f.u.	
	Oxygenon Liquid r.f.u.	
	Dismozon plus	Bode Chemie
	Oxycide	Ecolab USA
	Perform	Schülke & Mayr
	SteriMax Wipes Maxi	Aseptix

Class of active ingredient	Surface disinfectants	Manufacturer
Quaternary ammonium compounds	Mikrozid sensitive liquid[1)]	Schülke & Mayr
	Mikrozid sensitive wipes[1)]	
	Mikrozid alcohol-free liquid[1)]	
	Mikrozid alcohol-free wipes[1)]	
	acryl-des[1)]	
	Cleanisept Wipes Maxi	Dr. Schumacher
	Surfa'Safe Premium	ANIOS Laboratories
	Wip'Anios Excel	
	Tuffie 5	Vernacare

1) Virucidal against enveloped viruses

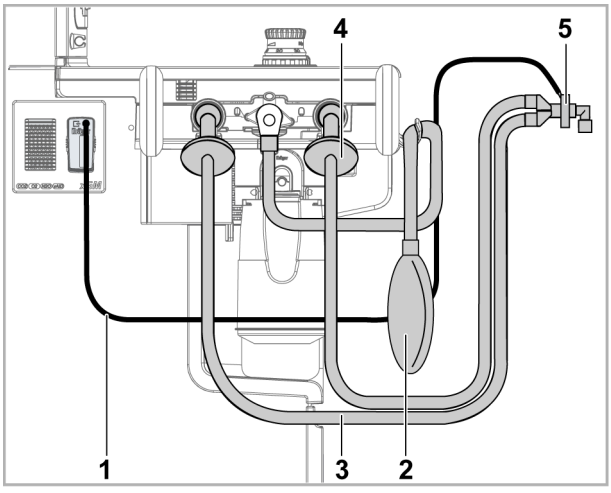
Dräger states that oxygen-releasing agents and chlorine-releasing agents may cause color change in some materials. Color change does not indicate that the product is not functioning correctly.

13.6 Preparation

13.6.1 Disassembling the patient-specific accessories

1. ⚠ **WARNING**
   Risk of infection
   Used sample lines and water traps may be infectious due to the breathing gases that passed through them.
   - ► Replace the sample line and the water trap regularly in the following situations:
     - – If the sample line is connected to the filter on the Y-piece, replace it daily.
     - – If there is no filter fitted to the Y-piece and the sample line is connected directly to the Y-piece, replace the sample line after every patient.
   - ► Remove the sample line from the water trap.
   - ► Initially leave the water trap fitted to prevent infectious fluid from spurting out. Remove the water trap only after surface disinfection.
   - ► Replace the water trap after each patient.

Unscrew the sample line (1).



2. Remove the breathing bag (2) together with the breathing bag hose.
3. Remove the breathing circuit (3) and the filters at positions (4) or (5).

13.6.2 Disposing or reprocessing of patient-specific accessories

1. ⚠ **CAUTION**
   Risk of injury to patients due to failure of accessories
   Disposable products have been designed, tested, and manufactured exclusively for single use. Reuse, reprocessing or sterilization can result in failure of the accessory and injury to the patient.
   ► Do not reuse, reprocess, or sterilize disposable products.

   Dispose of the disposable accessories:
   – Sample line
   – Breathing circuit
   – Breathing bag
   – Filter
2. Reprocess the reusable accessories in accordance with their instructions for use.
   – Breathing circuit
   – Breathing bag

13.7 Surface disinfection with cleaning

13.7.1 Surface disinfection of the device surfaces

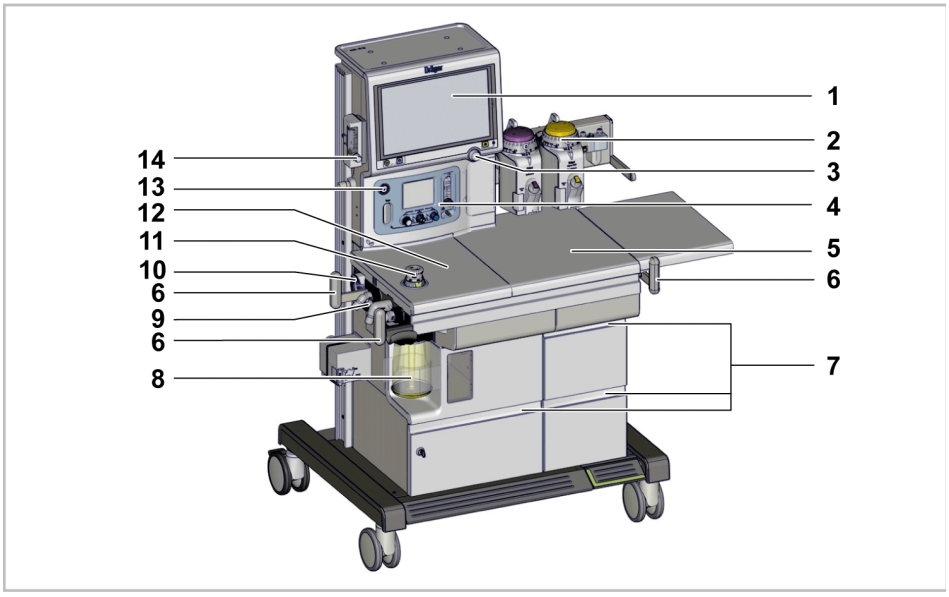
1. Remove soiling immediately. Use a cloth dampened with disinfectant to remove soiling.

2. **⚠ WARNING**
   Risk due to penetrating liquid
   Penetrating liquid may cause the following:
   – Damage to the device
   – Electric shock
   – Device malfunctions
   ► Ensure that no liquid penetrates the device.

   ⚠ CAUTION
   Risk of contaminating the device
   If the water trap is removed, fluid may get into the main device while it is being disinfected.
   ► Leave the water trap fitted during surface disinfection.

   Perform the surface disinfection of the entire device by wiping backwards and forwards at least 3 times:
   – In particular, disinfect device surfaces and hand contact points that are touched frequently.
   – Follow the list of validated disinfectants (see "Validated reprocessing procedures", page 225).

   The following illustration shows the frequently touched surfaces and hand contact points:



No.	Designation
1	Screen
2	Control dials of the vaporizers

No.	Designation
3	Rotary knob
4	Control elements on the gas mixing unit
5	Work surface, side table (option)
6	Handles
7	Handles on drawers
8	Absorber
9	Circuit plug on bag elbow
10	Water trap on the patient-gas measurement module (PGM)
11	APL valve
12	Breathing system cover
13	***O2+*** key
14	Flow control valve on external O_2 flowmeter (option)
15	Pressure reducers (on the rear of the device, not shown)

3. If required, perform the surface disinfection for other components of the anesthesia workstation, e.g., for a patient monitor.
4. After the product has been exposed to the disinfectant for the specified contact time, remove residual disinfectant.
5. Wipe with a cloth dampened with water (at least drinking-water quality). Allow the product to dry.
6. Check the product for visible soiling. Repeat steps 1 to 5 if necessary.
7. Check the product for visible damage and replace if necessary.

13.8 Disassembly

13.8.1 Preparation

1. Switch off the device and all devices connected to it.
2. Disconnect all power plugs.

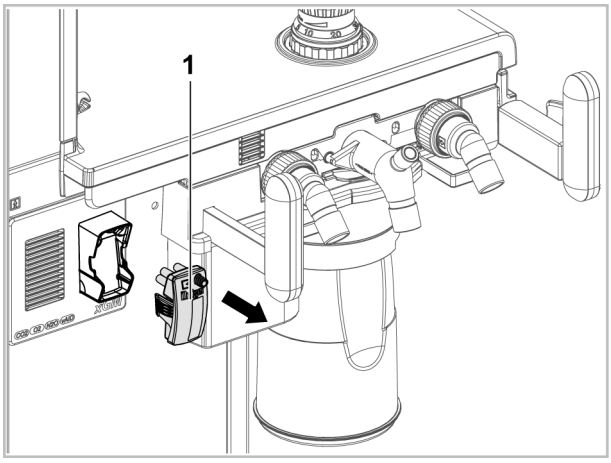
13.8.2 Disassembling the water trap

The water trap is only present if the device is equipped with the integrated patient-gas measurement module.

Prerequisite: The sample line has been removed.

► ⚠ **WARNING**
Risk of infection
The water trap may contain infectious fluid.
► Proceed carefully when emptying and take protective measures if necessary.
► Follow the infection prevention policies and reprocessing regulations of the health-care facility.

Pull out and dispose of the water trap (1).



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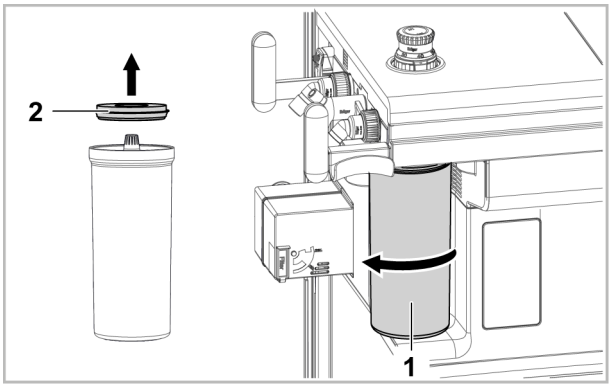
13.8.3 Disassembling the CO_2 absorber

13.8.3.1 Reusable CO_2 absorber

1. Unscrew the CO_2 absorber (1) from the breathing system.



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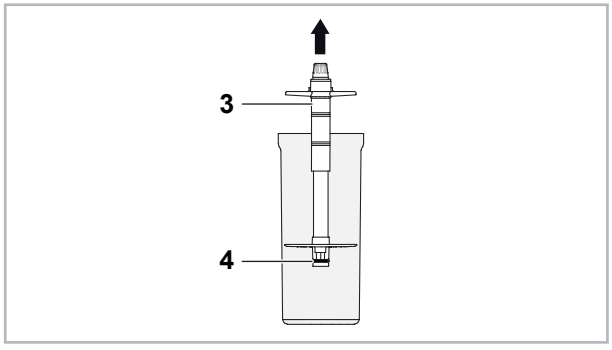
2. Remove and dispose of the optional disposable dust filter (2).
3. ⚠ **CAUTION**
   Risk of chemical burns
   Soda lime is caustic and is a strong irritant for eyes, skin, and airway.
   ► Handle the soda lime carefully and do not spill it.

   Empty out the used soda lime and dispose of it according to its instructions for use.

4. Remove the absorber insert (3) from the absorber container. The sealing ring (4) remains on the absorber insert.



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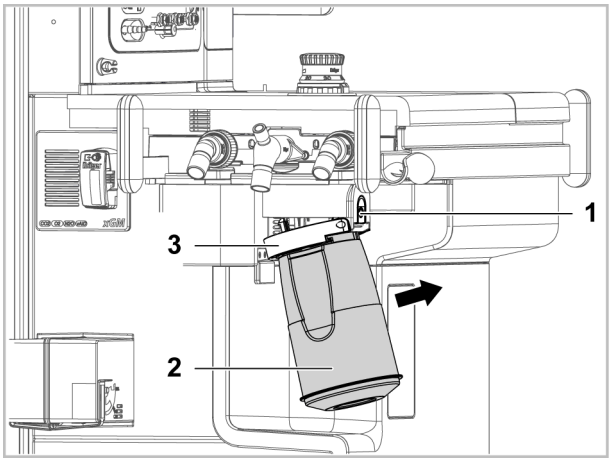
13.8.3.2 CLIC absorber (disposable absorber)

1. Press the release button (1). The CLIC adapter flips open.



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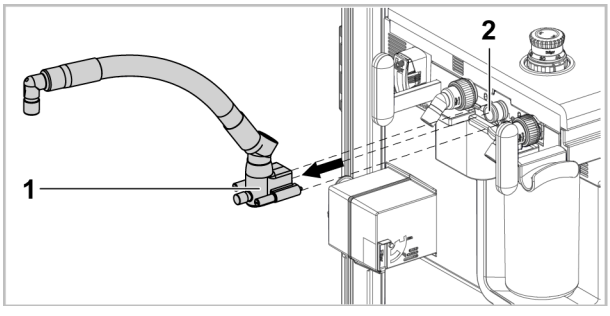
2. Withdraw the CLIC absorber (2) upwards from the holder (3).
3. Fold the holder back again until it engages audibly.
4. Dispose of the CLIC absorber in accordance with its instructions for use.

13.8.4 Disassembling the breathing bag arm (option)



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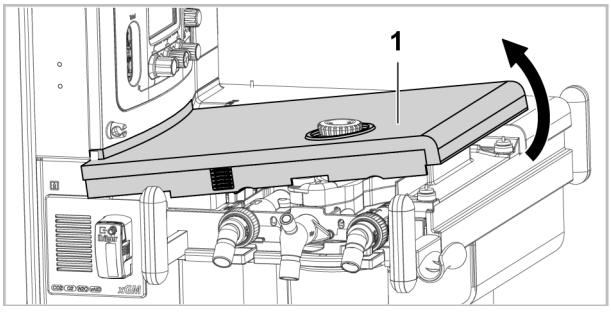
1. Unfasten the knurled screws on the attachment piece (1) for the breathing bag arm.
2. Remove the attachment piece (1) with the breathing bag arm from the socket (2) on the breathing system.

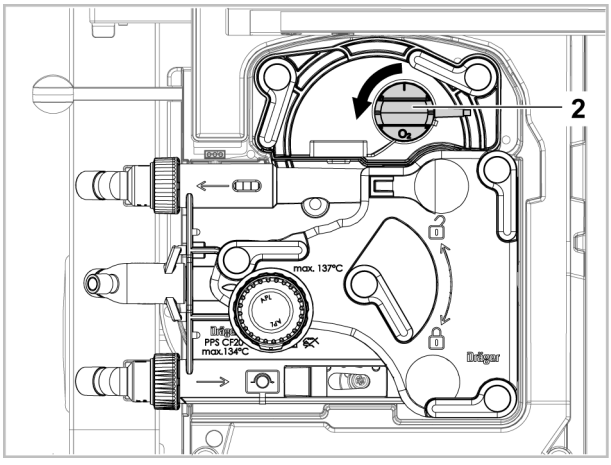
13.8.5 Disassembling the O_2 sensor

1. Remove the breathing system cover (1).



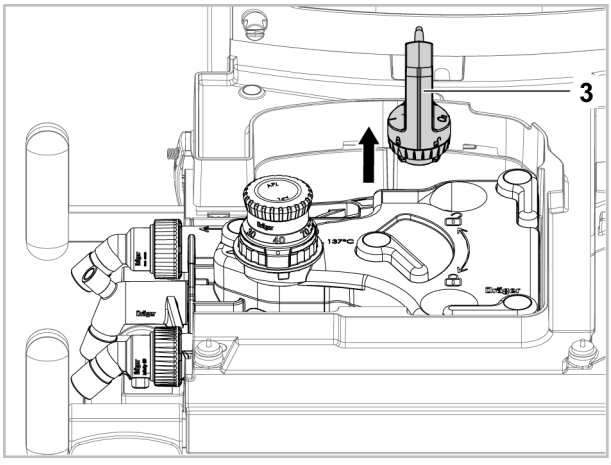
37062

2. Turn the O_2 sensor (2) counterclockwise.



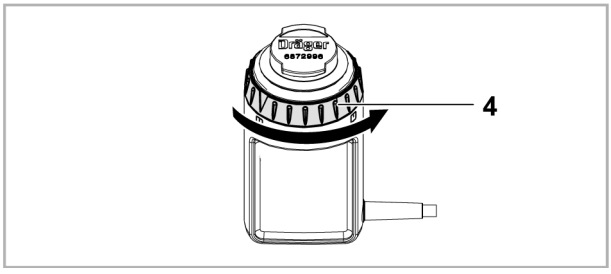
37079

3. Take out the O_2 sensor (3).



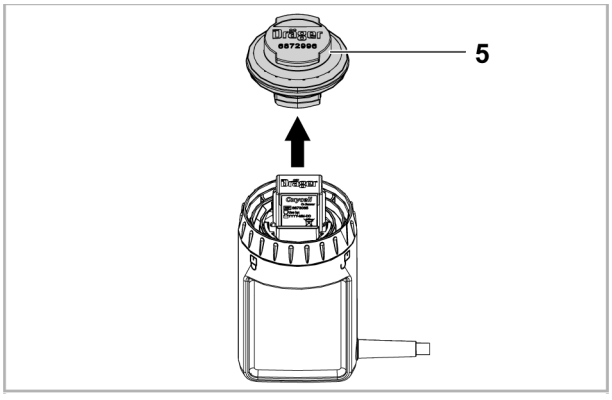
37080

4. Turn the knurled nut (4) approximately 90° counterclockwise.



37172

5. Remove the sensor cap (5).



37173

ℹ Do not remove the sensor cell. Otherwise, the calibration data will be lost. This may result in a waiting time when putting the device back into operation.

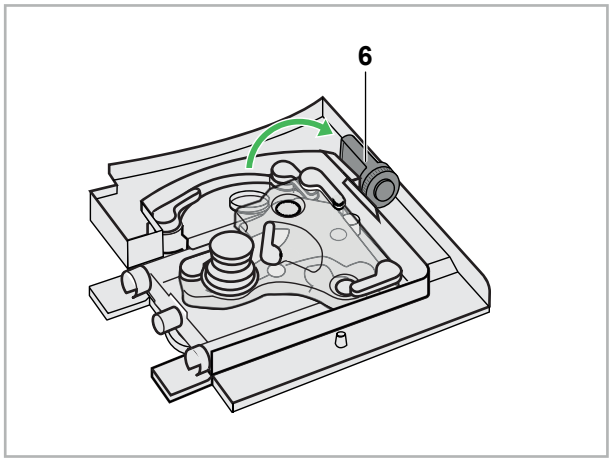
6. ⚠ **WARNING**

Risk of incorrect gas measurement

Reprocessing and sterilization can damage the O_2 sensor cell. This may result in a malfunctioning measurement and the patient may be put at risk.

► Do not disinfect or sterilize the O_2 sensor cell, or immerse it in other fluids.

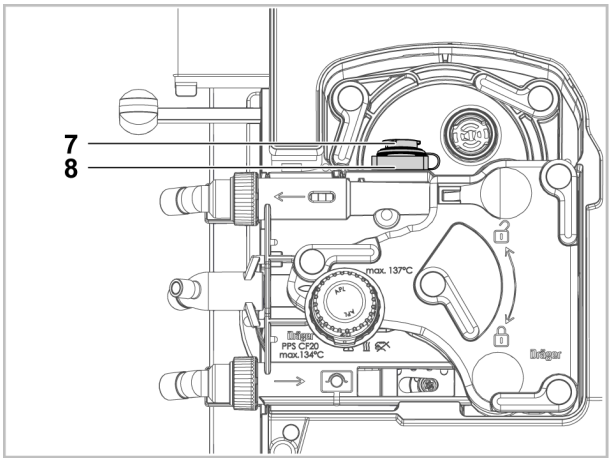
Place the O_2 sensor as shown (6).



40978

The sealing cap (7) remains on the holder (8).

On the product variant with integrated patient-gas measurement module, the sealing cap must be plugged into the holder.



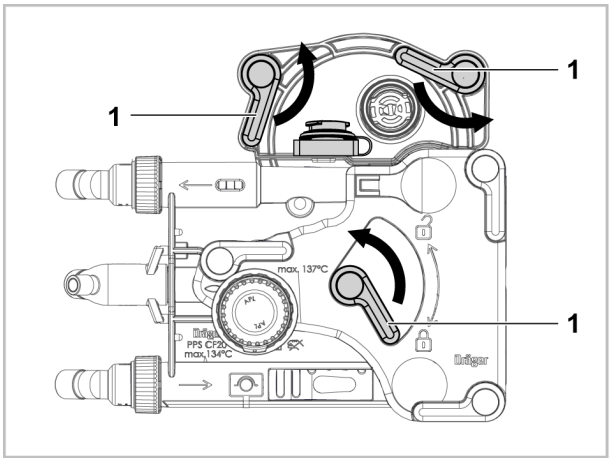
41134

13.8.6 Removing the breathing system

ℹ To prevent accidental penetration of soda lime into the breathing system, make sure that the reusable CO_2 absorber has been removed.

Prerequisite: The breathing system cover has been removed.

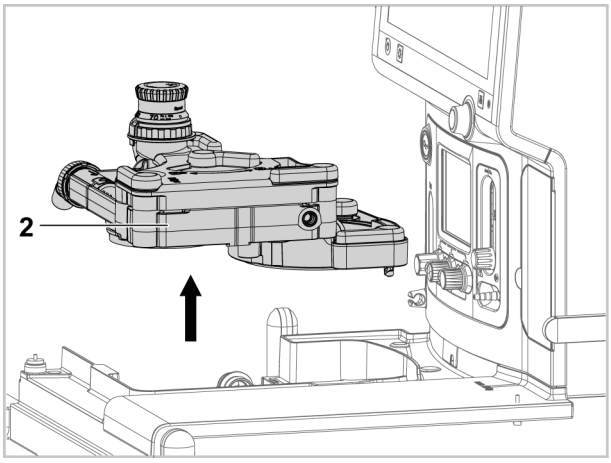
1. To unlock, turn the 3 levers (1) counterclockwise by approximately 120°.



37063

2. ⚠ **CAUTION**
   Risk of injury due to breathing system warmer
   When the breathing system warmer is switched on, the bottom side of the breathing system and the heating plate beneath it can become very hot.
   ► Allow the breathing system to cool off before removing.

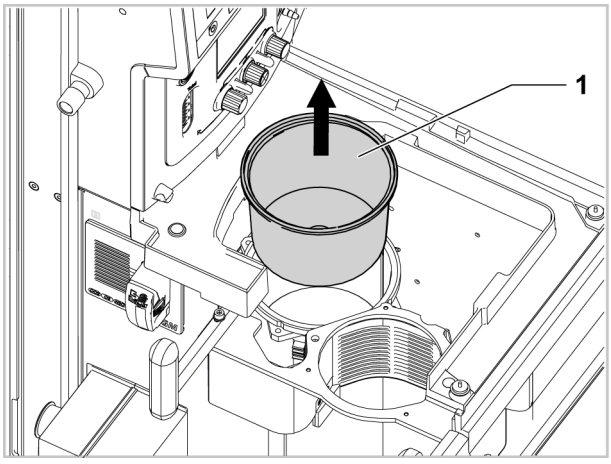
Remove the breathing system (2) vertically upwards from the breathing system mount.



37069

13.8.7 Removing the piston diaphragm

► Remove the piston diaphragm (1) from the ventilator. If necessary, remove any residual moisture present.



37057

13.8.8 Disinfecting the breathing system mount

Note the following information:

– Do not use alcohol-based disinfectants.
– Remove any residues.
– Ensure lint-free cleaning and disinfection.
– Do not allow fluid to penetrate.

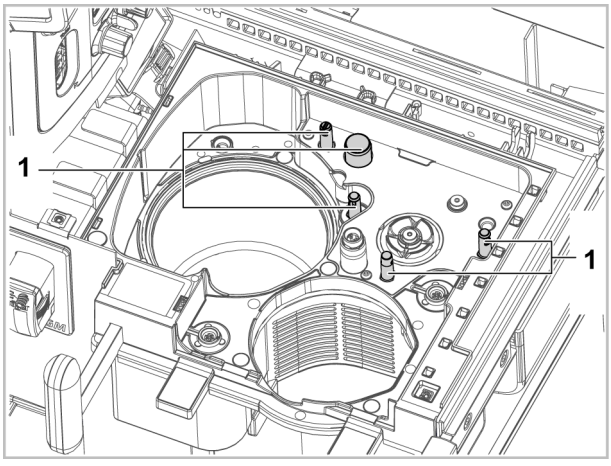
Prerequisite:

– The breathing system cover has been removed.
– The breathing system has been removed.

⚠ WARNING
Risk due to penetrating liquid
Penetrating liquid may cause the following:
– Damage to the device
– Electric shock
– Device malfunctions
► Ensure that no liquid penetrates the device.

Perform the following steps:

1. Use a cloth soaked in disinfectant or use a ready-to-use disposable cloth.
2. Perform the surface disinfection of the breathing system mount by wiping backwards and forwards at least 3 times. Take particular care to disinfect the pneumatic connections (1).

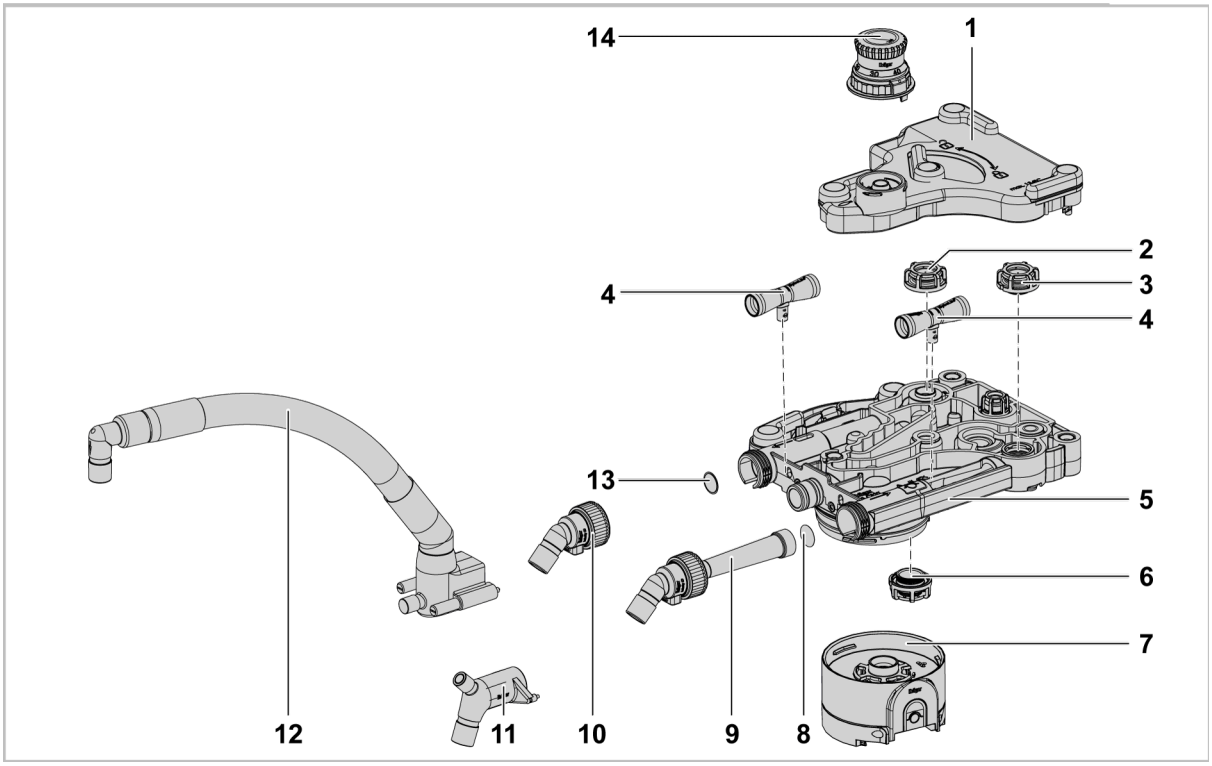


39534

3. Repeat steps 1 and 2 (4 times each).

13.9 Disassembling the breathing system

13.9.1 Overview

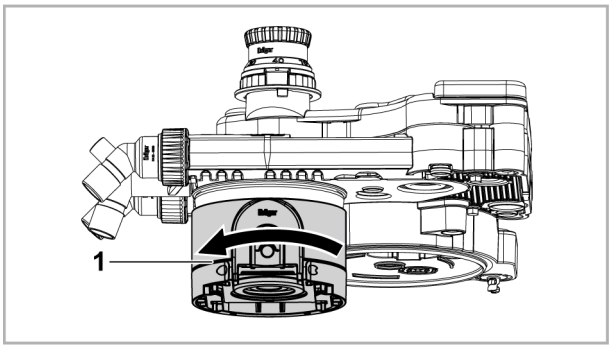


No.	Designation	Remarks
1	Upper part of the breathing system	
2	Non-return valve (yellow)	
3	Non-return valve (blue)	
4	Flow sensors	Reprocessing is performed in accordance with their own instructions for use.
5	Lower part of the breathing system	
6	Non-return valve (black)	
7	CLIC adapter (option)	
8	Incident flow mesh, expiration	Remains in the expiratory port.
9	Expiratory port	
10	Inspiratory port	
11	Bag elbow	Remains at the lower part of the breathing system.
12	Breathing bag arm (option)	When the breathing bag arm is used, there is no bag elbow fitted to the lower part of the breathing system.
13	Incident flow mesh, inspiration	Remains in the lower part of the breathing system.
14	APL valve	

13.9.2 Disassembling the components

13.9.2.1 CLIC adapter (option)

1. Screw off the CLIC adapter (1).



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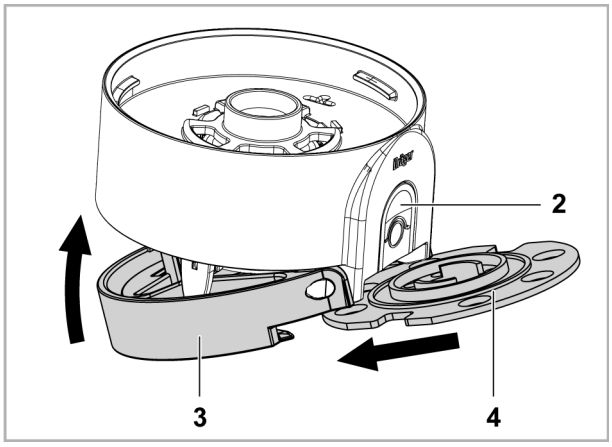
2. Press the release button (2). The holder (3) flips open.



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3. Push the cleaning plate (4) fully into the adapter.
4. Close the holder (3) so that it engages.

13.9.2.2 Flow sensors and ports

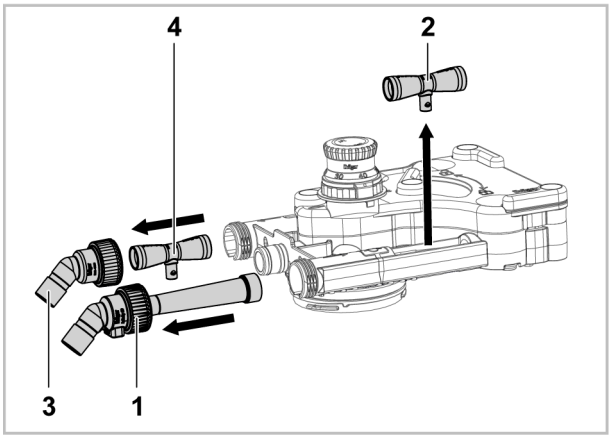
⚠ CAUTION

Risk of failure of flow measurement

Improper reprocessing and soiling, such as residues or particles, can damage the flow sensor.

- ► No machine cleaning or disinfection
- ► No plasma sterilization or radiation sterilization
- ► No water jets, compressed air, brushes or the like
- ► No ultrasonic bath
- ► No hot-steam sterilization with Spirolog and Infinity ID flow sensors
- ► Clean and disinfect the flow sensor in accordance with the corresponding instructions for use.
- ► For disinfecting the flow sensor use only clean disinfectant solutions.

1. Unfasten and remove the expiratory port (1).



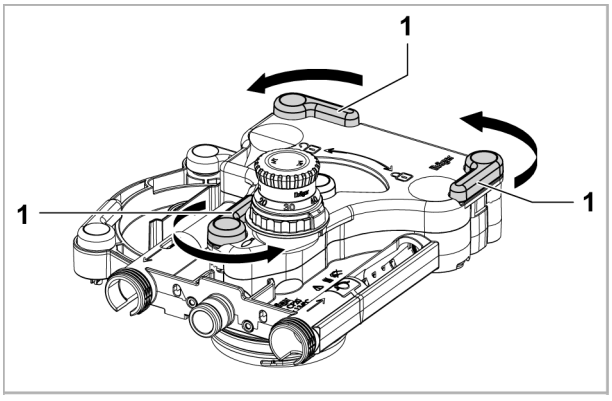
37071

2. Remove the expiratory flow sensor (2).
3. Unfasten and remove the inspiratory port (3).
4. Remove the inspiratory flow sensor (4).

If the breathing system is equipped with a bag elbow, the bag elbow remains on the breathing system.

13.9.2.3 Upper part of the breathing system

1. To unlock, turn the 3 levers (1) counterclockwise by approximately 120°.



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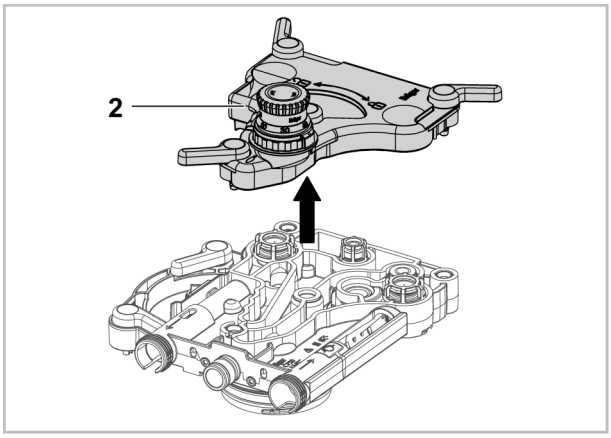
2. Lift off the upper part of the breathing system (2).

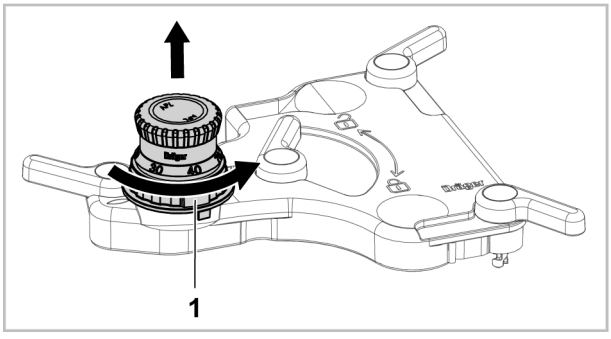


39630

13.9.2.4 APL valve

► **⚠ WARNING**
Risk of damage to breathing system
If the APL valve is not removed before the breathing system is reprocessed, it may be damaged by the reprocessing measures. This can lead to leaks in the breathing system.
► Always remove the APL valve prior to reprocessing.

Using the lower knurled nut (1), unscrew the APL valve from the upper part of the breathing system.

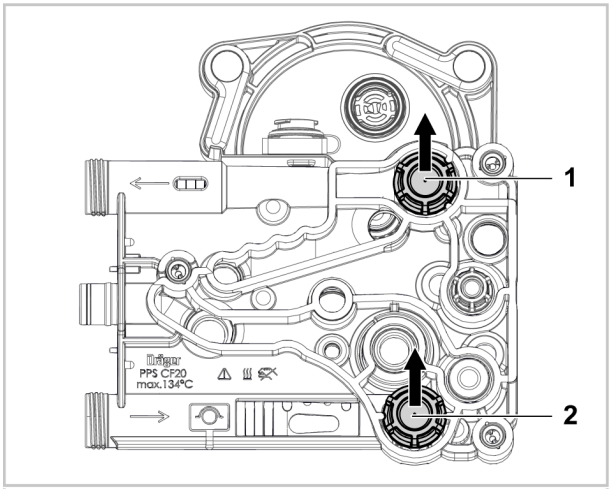


39498

13.9.2.5 Non-return valves and fresh-gas decoupling valve

On the top side of the lower part of the breathing system:

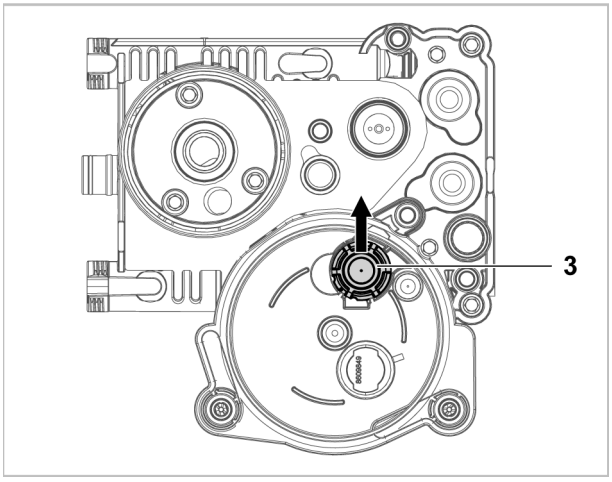
► Remove the yellow inspiratory valve (1) and the blue expiratory valve (2) from the lower part of the breathing system.



37058

On the bottom side of the lower part of the breathing system:

► Turn the black fresh-gas decoupling valve (3) counterclockwise and remove it.



13.9.2.6 List of disassembled components

After complete disassembly of the breathing system, the following machine-reprocessable components are present:

– Upper part of the breathing system
– Lower part of the breathing system
– Sensor cap of the O_2 sensor
– APL valve
– Inspiratory port
– Expiratory port
– Inspiratory valve (yellow)
– Expiratory valve (blue)
– Fresh-gas decoupling valve (black)
– Piston diaphragm
– Breathing bag arm (option)

Optionally present are:

– Absorber container and absorber insert
– CLIC adapter (option)

13.10 Machine reprocessing

13.10.1 Preparation

Prerequisite: The breathing system and components are completely disassembled.

ℹ Information on the number of reprocessing cycles

– At least 250 reprocessing cycles are possible for the breathing system.

After complete disassembly of the breathing system, the following machine-reprocessable components are present:

– Upper part of the breathing system
– Lower part of the breathing system
– Sensor cap of the O_2 sensor
– APL valve
– Inspiratory port
– Expiratory port
– Inspiratory valve (yellow)
– Expiratory valve (blue)
– Fresh-gas decoupling valve (black)
– Piston diaphragm
– Breathing bag arm (option)

Optionally present are:

– Absorber container and absorber insert
– CLIC adapter (option)

Required aids:

– Hose for connecting the breathing bag arm
– Hose for connecting the absorber insert

13.10.2 Positioning the components

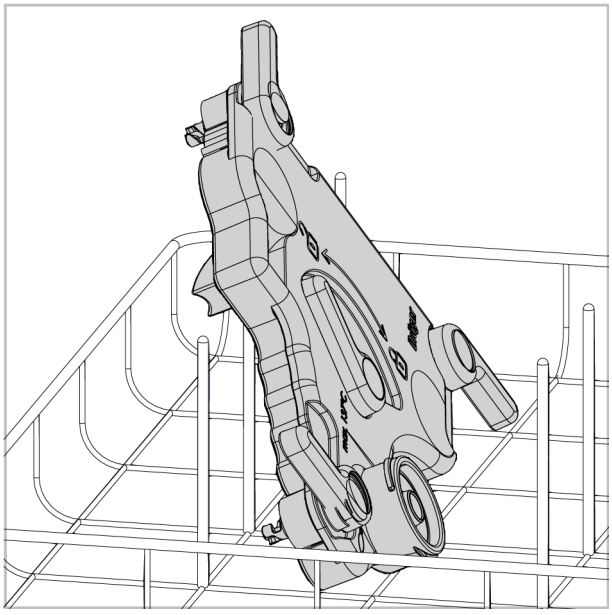
Depending on device configuration, it is possible that not all components will be present.

► Position the components securely in the load carrier. Ensure the following:
  – All surfaces and interior spaces can be flushed completely.
  – The water can drain off freely.

The following illustrations are nonbinding recommendations. Depending on the washer-disinfector used, alternative positioning is possible.

Upper part of the breathing system

► Position the upper part of the breathing system with a slight tilt.



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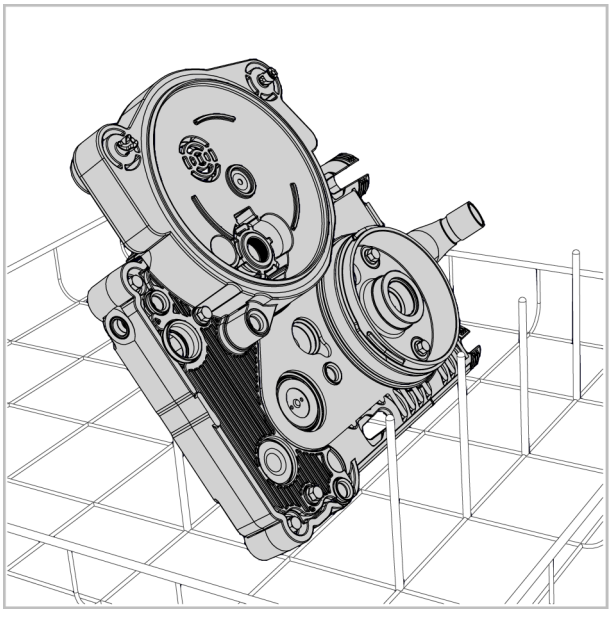
Lower part of the breathing system

► Position the lower part of the breathing system with a slight tilt.

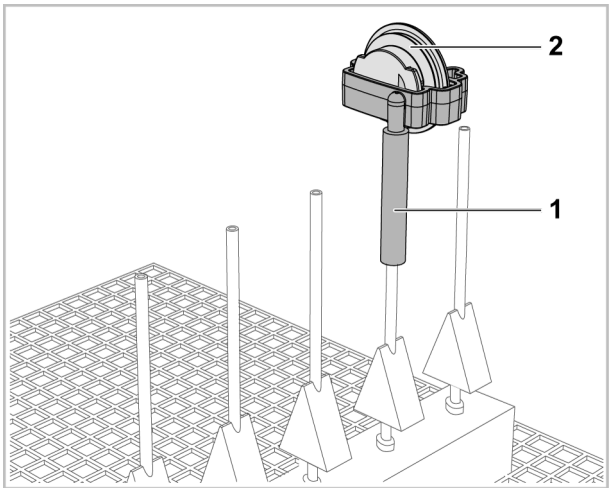


39500

Sensor cap of the O_2 sensor

A special flushing adapter is required for the sensor cap.

1. Push the flushing adapter together with the silicone hose (1) onto a flushing nozzle.



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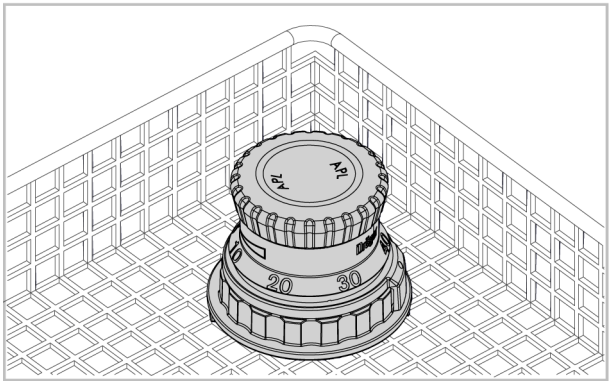
2. Insert the sensor cap (2) into the flushing adapter.

APL valve

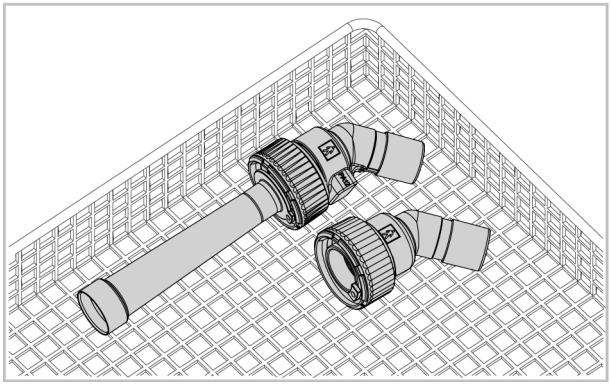
► Lay the APL valve in the basket.



38569

Inspiratory port and expiratory port

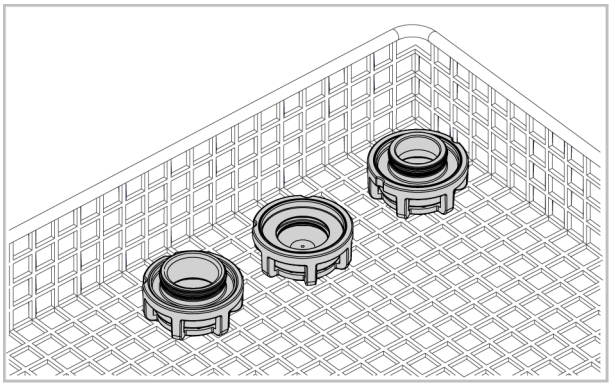
► Lay the ports in the basket.



39014

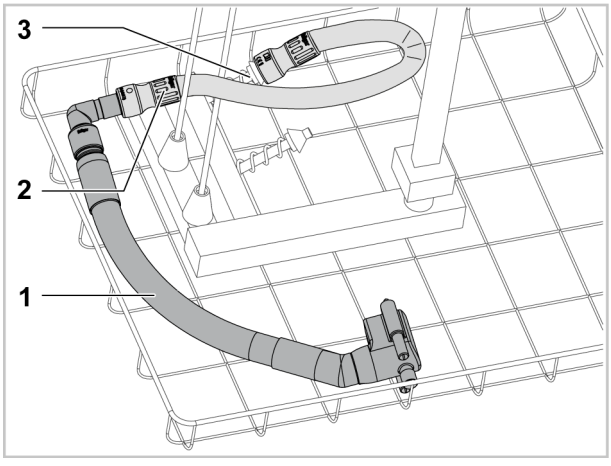
Non-return valves and fresh-gas decoupling valve

► Position the valves with the valve cages facing downwards.



Breathing bag arm (option)

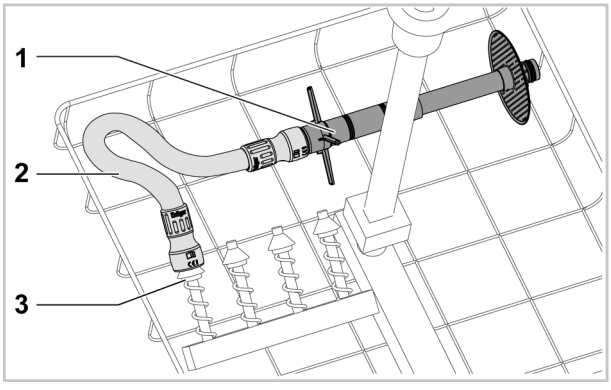
1. Connect the breathing bag arm (1) to a hose (2).



2. Lay the breathing bag arm together with the hose in the load carrier.
3. Connect the hose (2) to a flushing nozzle (3).

Absorber insert

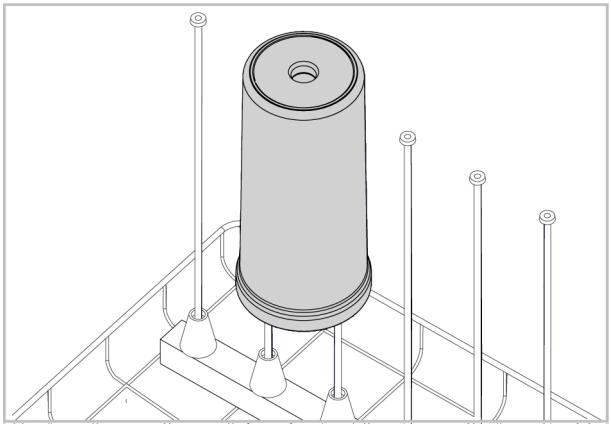
1. Connect the absorber insert (1) to a hose (2).



2. Lay the absorber insert together with the hose in the load carrier.
3. Connect the hose (2) to a flushing nozzle (3).

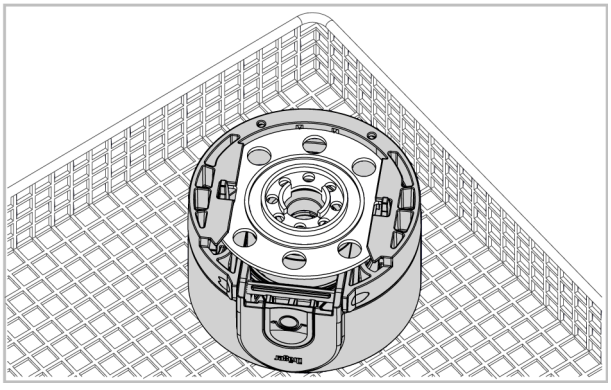
Absorber container

► Place the absorber container with the opening facing down on an injector nozzle.



CLIC adapter (option)

► Lay the CLIC adapter in the basket with the cleaning plate facing upwards.



13.10.3 Machine cleaning with thermal disinfection

Use a washer-disinfector that meets the requirements of the standard ISO 15883. Dräger recommends the use of a load carrier for anesthesia accessories and ventilation accessories.

Follow the list of validated disinfectants (see "Validated reprocessing procedures", page 225).

Prerequisite: The components have been positioned appropriately in the load carrier.

1. Use a suitable cleaning agent.
2. Select a suitable cycle.

   Use a cycle with the following phases:

   – Pre-wash
   – Cleaning using a suitable cleaning agent in accordance with the manufacturer’s instructions for use
   – Final rinsing with demineralized water

– Thermal disinfection
– Drying

Proceed as follows after the cycle has ended:

1. Check all components for visible soiling.
2. Repeat the cycle if necessary.

13.10.4 Drying the components

► Allow all the components to dry completely.
To prevent residual moisture, adjust the drying times during machine reprocessing.

13.10.5 Additional reprocessing procedures

Additional reprocessing procedures have not been tested by Dräger with regard to their effectiveness.

However, the materials in the following components permit steam sterilization up to a maximum of 137 °C (278.6 °F):

– Upper part of the breathing system
– Lower part of the breathing system
– Sensor cap of the O_2 sensor
– APL valve
– Inspiratory port
– Expiratory port
– Inspiratory valve (yellow)
– Expiratory valve (blue)
– Fresh-gas decoupling valve (black)
– Piston diaphragm
– Breathing bag arm (option)
– Absorber container
– Absorber insert

► After sterilization, inspect the components for damage and replace if necessary.

13.11 Fitting and assembly

13.11.1 Preparation

Prerequisite: All components have been reprocessed and dried.

⚠ WARNING
Risk of fire
High temperatures arise in the flow sensors, for example, in operation or while calibrating during a system test. Due to the high temperatures, residual vapors of flammable disinfectants (e.g., alcohols) and residues that were not removed during reprocessing may ignite.

- ► Ensure particle-free cleaning and disinfection.
- ► After disinfection, allow the flow sensor to air for at least 30 minutes.
- ► Before inserting the flow sensor, check for visible damage and soiling, such as residual mucus, medication aerosols, and particles.
- ► Replace flow sensors when damaged, soiled, or not particle-free.

1. Inspect the following components for damage and wear:
   - Upper part of the breathing system
   - Lower part of the breathing system
   - Incident flow mesh in the inspiratory limb of the lower part of the breathing system
   - Sensor cap of the O_2 sensor
   - APL valve
   - Inspiratory port
   - Expiratory port
   - Incident flow mesh in the expiratory port
   - Inspiratory valve (yellow)
   - Expiratory valve (blue)
   - Fresh-gas decoupling valve (black)
   - Piston diaphragm
   - Flow sensors
   - Seals and sealing rings

   If the incident flow meshes are damaged, contact DrägerService.
2. The following parts must be free from residues:
   - Incident flow meshes in the inspiratory limb of the lower part of the breathing system and in the expiratory port
   - Valve plate in the inspiratory valve (yellow)
   - Valve plate in the expiratory valve (blue)
   - Valve plate in the fresh-gas decoupling valve (black)

   If necessary, remove any residues on the valve plates with a soft cloth.

13.11.2 Assembling the breathing system

► **⚠ WARNING**
Risk of insufficient anesthetic gas concentration
If the component connections of the breathing system are not sufficiently leak-tight, ambient air may get into the breathing gas.
► Make sure that all components of the breathing system are connected tightly.

Assemble the breathing system in accordance with the instructions in this chapter.

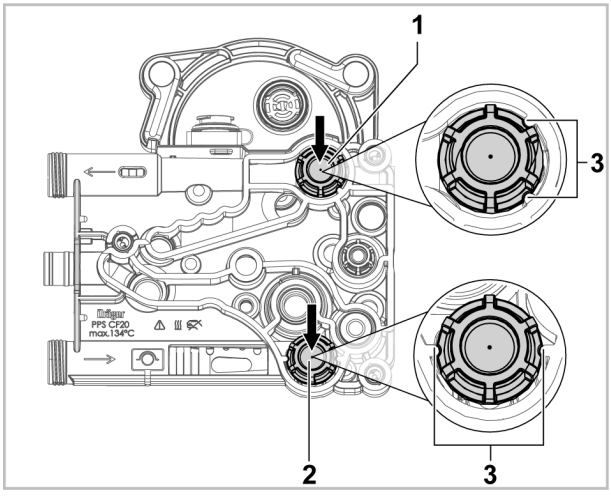
13.11.2.1 Inserting the non-return valves

The non-return valves (yellow inspiratory valve and blue expiratory valve) must be fitted on the top side of the lower part of the breathing system.

There are recesses in the valve cages of the non-return valves to facilitate correct fitting. These recesses are arranged differently on the inspiratory valve than on the expiratory valve.

Perform the following steps for the non-return valves:

1. Align the inspiratory valve (1) and the expiratory valve (2) so that the recesses (3) on the valve cages align with the corresponding lugs on the lower part of the breathing system.



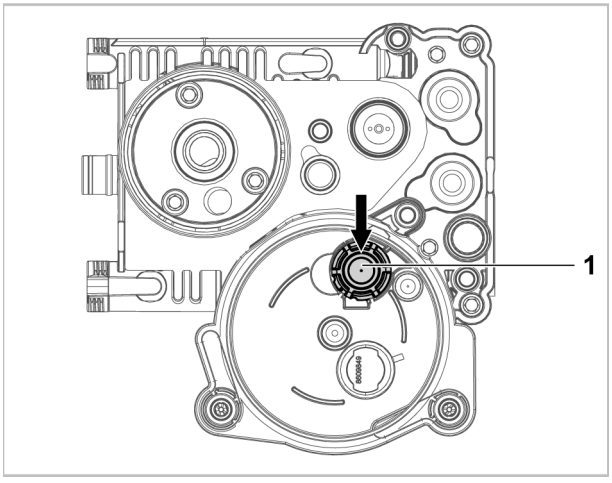
36497

2. Insert the non-return valves.

13.11.2.2 Inserting the fresh-gas decoupling valve

The fresh-gas decoupling valve (black) must be fitted on the bottom side of the lower part of the breathing system.

1. Turn the upper part of the breathing system over.
2. Insert the valve (1) and lock it by turning it clockwise.

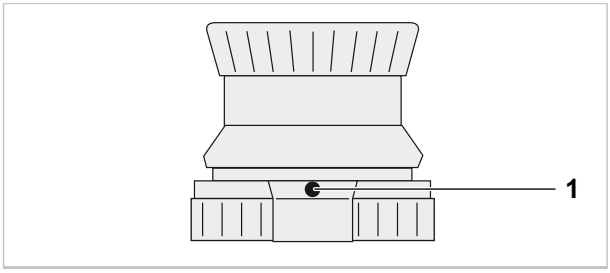


37097

13.11.2.3 Fitting the APL valve

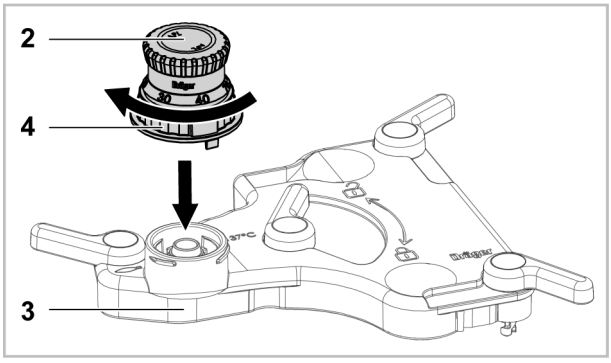
1. **⚠ WARNING**
   Risk of an incorrectly set pressure limitation
   If the lower dot marked on the APL valve is not aligned correctly, the APL valve may be set or read off incorrectly.
   ► When fitting, take care that the lower dot is facing the user during operation.

Align the APL valve correctly. The lower dot (1) must face the user during operation.



39506

2. Place the APL valve (2) vertically on the upper part of the breathing system (3).

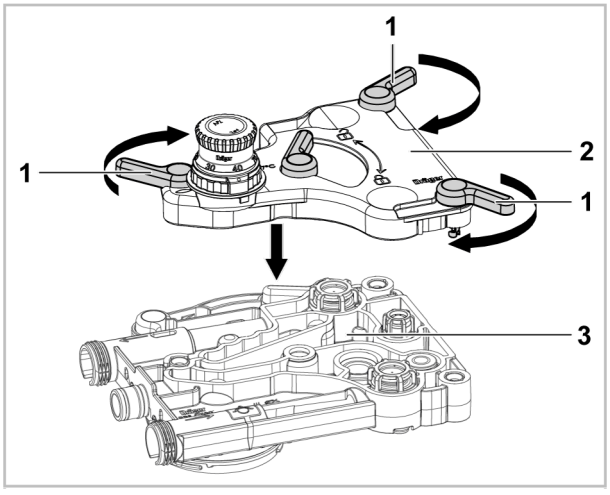


39507

3. Tighten the knurled nut (4).

13.11.2.4 Fitting the upper part of the breathing system

1. Make sure the levers (1) are rotated outward.

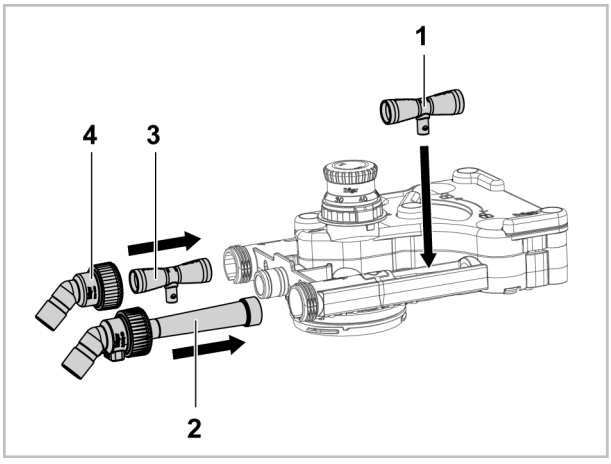


39505

2. Place the upper part of the breathing system (2) on the lower part of the breathing system (3).
3. Turn the levers (1) by approximately 120° clockwise.

13.11.2.5 Fitting the flow sensors and the ports

1. Insert the expiratory flow sensor (1).

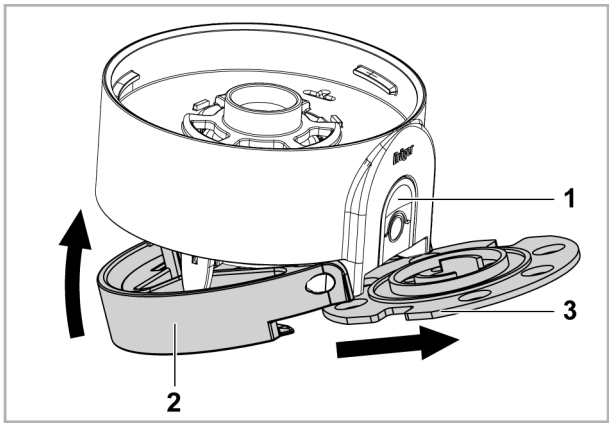


39508

2. Push in the expiratory port (2). Tighten the knurled nut.
3. Insert the inspiratory flow sensor (3).
4. Push in the inspiratory port (4). Tighten the knurled nut.

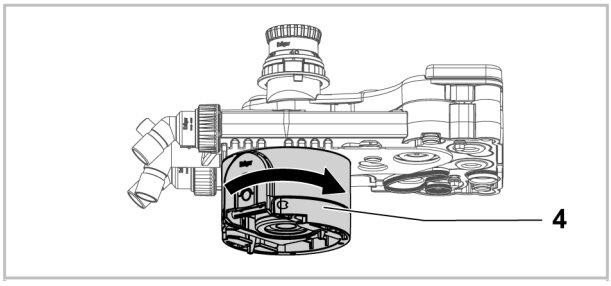
13.11.2.6 Fitting the CLIC adapter (optional)

1. Press the release button (1). The holder (2) flips open.



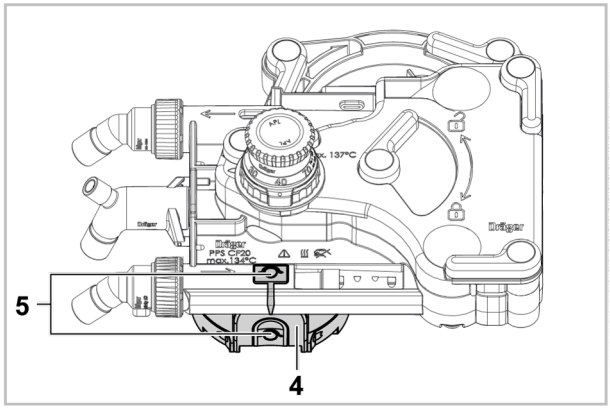
39509

2. Remove the cleaning plate (3) from the adapter.
3. Close the holder (2) so that it engages.
4. Screw the CLIC adapter (4) on to the lower part of the breathing system.



39510

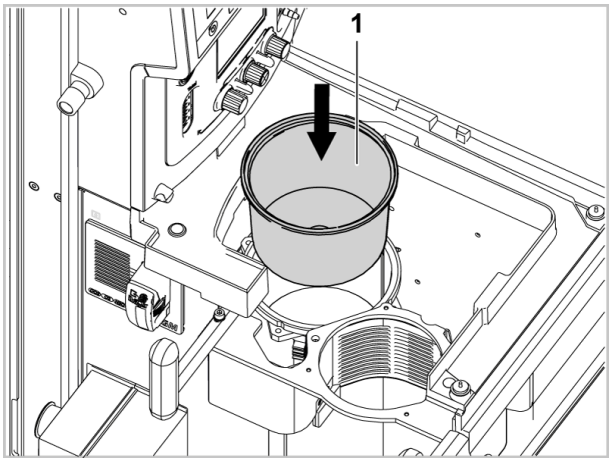
5. Check the correct orientation of the adapter (4). The two symbols (5) must align vertically.



39511

13.11.3 Inserting the piston diaphragm

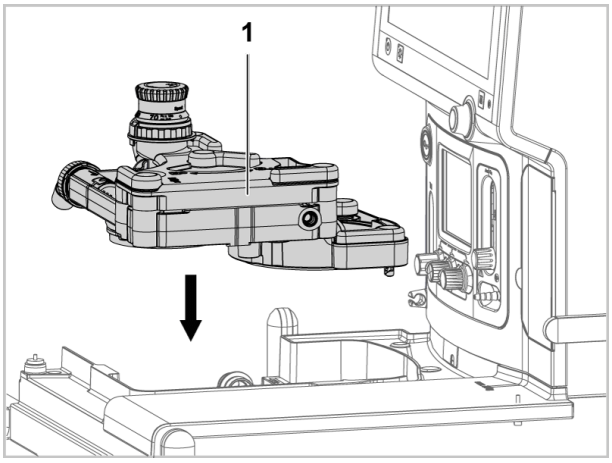
1. Insert the piston diaphragm (1) in the ventilator.
   Make sure that the Dräger inscription on the base of the piston diaphragm can be read from above.



36496

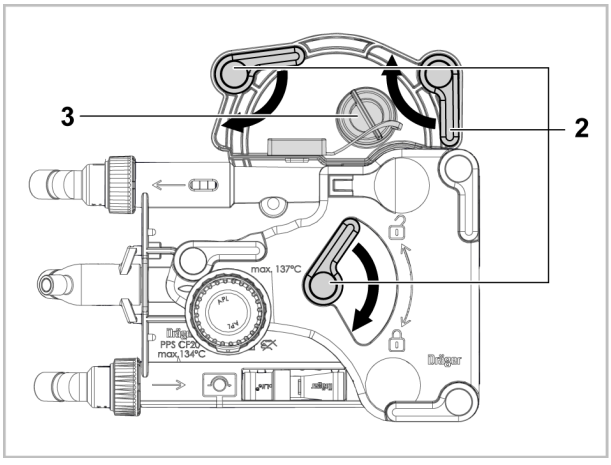
13.11.4 Inserting the breathing system

1. Insert the assembled breathing system (1) vertically into the breathing system mount.



36503

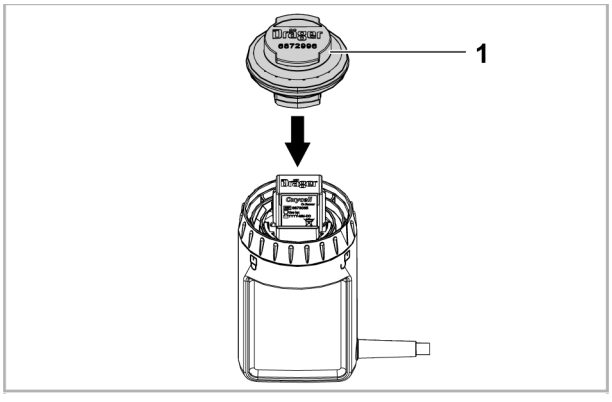
2. Turn the levers (2) by approximately 120° clockwise. The breathing system is now locked. On the product variant with integrated patient-gas measurement module, seal the O_2 sensor port with the sealing cap (3).



36504

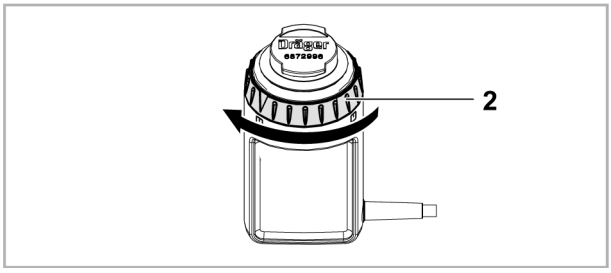
13.11.5 Assembling and inserting the O_2 sensor

1. Place the sensor cap (1) on the O_2 sensor.



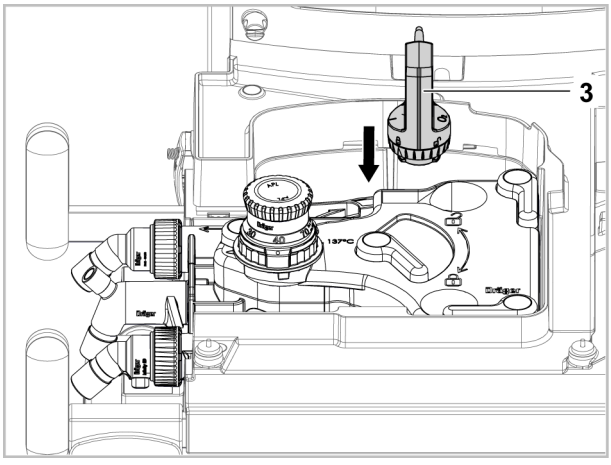
37178

2. Turn the knurled nut (2) about 90° clockwise. Turn it until the palpable resistance is overcome and a click is heard. The sensor cap is now fitted.



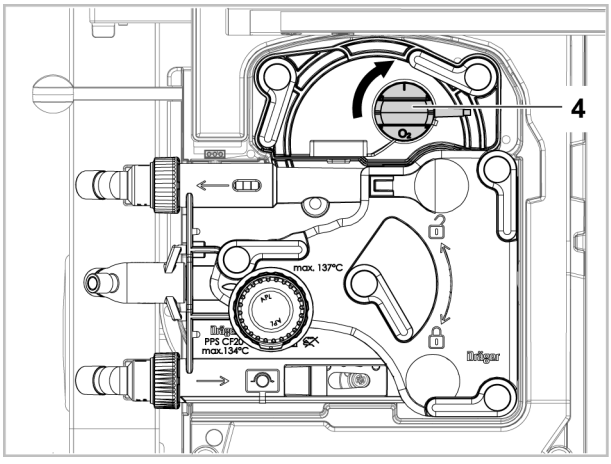
37179

3. Insert the O_2 sensor (3) into the sensor port.



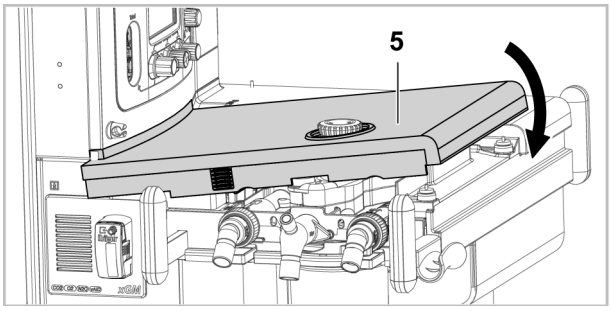
38271

4. Turn the O_2 sensor (4) clockwise.



38272

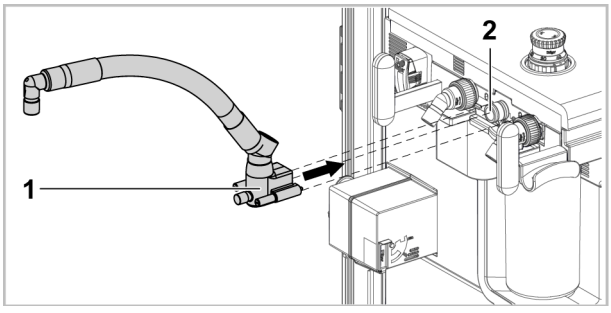
5. Put the breathing system cover (5) in place and click it into position.



36505

13.11.6 Fitting the breathing bag arm (option)

1. Plug the breathing bag arm (1) onto the socket (2) on the breathing system. Tighten the two knurled screws. Check that the breathing bag arm is held securely.



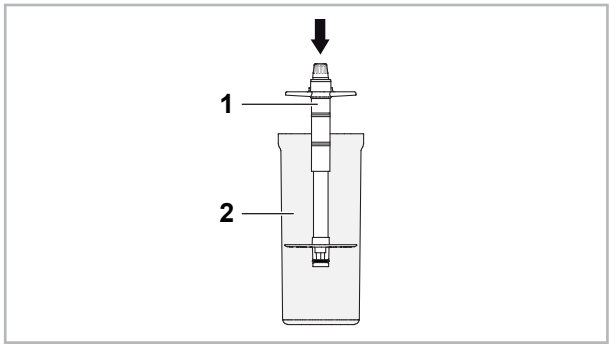
36506

2. Align the breathing bag arm so that collisions with other components are prevented.

13.11.7 Fitting the reusable CO_2 absorber

If there is no CLIC absorber being used, use the reusable CO_2 absorber.

1. Push the absorber insert (1) into the absorber container (2).



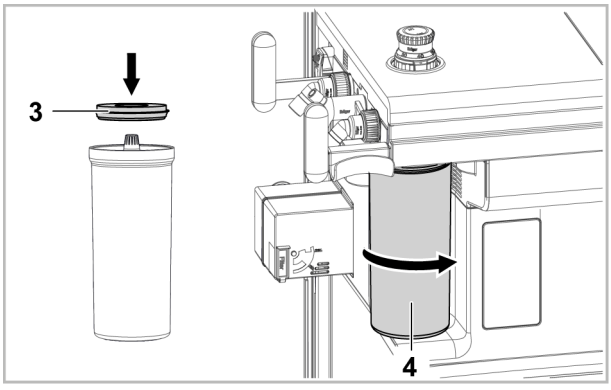
39516

2. **⚠ CAUTION**
   Risk of chemical burns
   Soda lime is caustic and is a strong irritant for eyes, skin, and airway.
   ► Handle the soda lime carefully and do not spill it.

   Fill the CO_2 absorber with fresh soda lime to the upper mark.
   Recommendation: Use Drägersorb 800 Plus or Drägersorb Free.

3. **⚠ WARNING**
   Risk of hypoventilation and incorrect gas measurement
   Reuse of the disposable dust filter can increase the filter resistance and impair the ventilation function of the device.
   ► If soda lime from third-party manufacturers is used, e.g., granular soda lime, use a disposable dust filter and replace it with every change of the soda lime.

   If soda lime from third-party manufacturers is used, insert a new disposable dust filter (3). Only use dust filters from the list of accessories.
   Only use undamaged filters.



39515

4. Attach the CO_2 absorber (4) to the breathing system from below. Rotate it in the direction of the arrow until it reaches the stop.

Follow the instructions for use for the particular soda lime.

13.12 Preparation before the next use

13.12.1 Fitting patient-specific accessories and consumables

► **⚠ WARNING**
Risk due to particles and dust
In order to protect the patient from particles and dust, a filter must be used between the inspiratory limb of the breathing system and the patient.
► Use a filter at the Y-piece or at the inspiratory port.

Complete the device with the following accessories:

– Breathing hoses
– Breathing bag
– Filter
– Water trap
– Sample line

Observe the following information: "Selecting and connecting patient-specific accessories", page 67.

13.12.2 Checking the operational readiness

Prerequisite: The device is assembled and prepared ready for operation.

► Check the operational readiness with a system test.

Observe the following information: "Tests", page 126.

13.13 Brief instructions for reprocessing

The following information provides a quick overview of the individual steps during reprocessing. Follow the relevant chapters for detailed information and safety instructions.

Disassembling the patient-specific accessories

1. Unscrew the sample line.
2. Remove the breathing bag together with the breathing bag hose.
3. Disassemble the breathing circuit and the filters.

Disposing of or reprocessing patient-specific accessories

4. Dispose of the following disposable accessories:
   - Sample line
   - Breathing circuit
   - Breathing bag
   - Filter
5. Reprocess the following reusable accessories:
   - Breathing circuit
   - Breathing bag

Surface disinfection of the device surfaces

6. Disinfect the following surfaces on the device:
   - Screen
   - Control dials of the vaporizers
   - Rotary knob
   - Control elements on the gas mixing unit
   - Work surface
   - Handles
   - Handles on drawers
   - Absorber
   - CLIC adapter (option)
   - Circuit plug on bag elbow
   - Water trap on the integrated patient-gas measurement module (PGM)
   - APL valve
   - Breathing system cover
   - ***O2+*** key
   - Flow control valve on external O_2 flowmeter (option)
   - Pressure reducers (on the rear of the device)

Preparation for disassembly

7. Switch off the device and all devices connected to it.
8. Disconnect all power plugs.

Disassembling the water trap

9. Pull out and dispose of the water trap.

Disassembling the CO_2 absorber

10. Reusable CO_2 absorber
    a. Unscrew the absorber.
    b. Remove and dispose of the disposable dust filter.
    c. Empty out and dispose of the used soda lime.
    d. Remove the absorber insert from the absorber container.
11. CLIC absorber (disposable absorber)
    a. Remove and dispose of the CLIC absorber.

Disassembling the breathing bag arm (option)

12. Unscrew the breathing bag arm (option).

Disassembling the O_2 sensor

13. Disassemble the O_2 sensor.
14. Remove the sensor cap.

Removing the breathing system

15. Remove the breathing system.

Removing the piston diaphragm

16. Remove the piston diaphragm.

Disinfecting the breathing system mount

17. Disinfect the breathing system mount.

Disassembling the breathing system

18. CLIC adapter (option)
    a. Unscrew the adapter.
    b. Insert the cleaning plate and close the holder.
19. Disassembling the flow sensors and ports
    a. Remove the expiratory port.
    b. Remove the expiratory flow sensor.
    c. Remove the inspiratory port.
    d. Remove the inspiratory flow sensor.
20. Lift off the upper part of the breathing system.
21. Screw off the APL valve.
22. Remove the non-return valves.
    - Inspiratory valve (yellow)
    - Expiratory valve (blue)
23. Remove the fresh-gas decoupling valve (black).

Machine reprocessing

24. Position the following parts appropriately and perform machine reprocessing:
    - Upper part of the breathing system
    - Lower part of the breathing system
    - Sensor cap of the O_2 sensor
    - APL valve
    - Inspiratory port

- Expiratory port
- Inspiratory valve (yellow)
- Expiratory valve (blue)
- Fresh-gas decoupling valve (black)
- Piston diaphragm
- Breathing bag arm (option)
- Absorber container and absorber insert
- CLIC adapter (option) with cleaning plate fitted

Drying

25. Allow all the components to dry completely.

Steam sterilization

26. If necessary, steam sterilize the following components:
    - Upper part of the breathing system
    - Lower part of the breathing system
    - Sensor cap of the O_2 sensor
    - APL valve
    - Inspiratory port
    - Expiratory port
    - Inspiratory valve (yellow)
    - Expiratory valve (blue)
    - Fresh-gas decoupling valve (black)
    - Piston diaphragm
    - Breathing bag arm (option)
    - Absorber container and absorber insert

Preparation for fitting and assembly

27. Inspect the following components for damage and wear:
    - Upper part of the breathing system
    - Lower part of the breathing system
    - Sensor cap of the O_2 sensor
    - Incident flow mesh in the inspiratory limb of the lower part of the breathing system
    - APL valve
    - Inspiratory port
    - Expiratory port
    - Incident flow mesh in the expiratory port
    - Inspiratory valve (yellow)
    - Expiratory valve (blue)
    - Fresh-gas decoupling valve (black)
    - Piston diaphragm
    - Flow sensors
    - Seals and sealing rings
28. The following parts must be free from residues:
    - Incident flow meshes for the flow sensors
    - Valve plates of the non-return valves

Assembling the breathing system

29. Insert the non-return valves:
    - Inspiratory valve (yellow)
    - Expiratory valve (blue)
30. Insert the fresh-gas decoupling valve (black) and lock it by turning.
31. Fit the upper part of the breathing system.
32. Fit the APL valve.
33. Fit the flow sensors and ports.
    a. Insert the expiratory flow sensor.
    b. Screw the expiratory port tight.
    c. Insert the inspiratory flow sensor.
    d. Screw the inspiratory port tight.
34. CLIC adapter (option)
    a. Remove the cleaning plate.
    b. Screw on the adapter.

Inserting the piston diaphragm

35. Insert the piston diaphragm.

Inserting the breathing system

36. Insert the breathing system.

Assembling and inserting the O_2 sensor

37. Insert the sensor cap.
38. Fit the O_2 sensor.

Fitting the breathing bag arm (option)

39. Fit the breathing bag arm (option).

Fitting the CO_2 absorber

40. Reusable CO_2 absorber
    a. Fit the absorber insert.
    b. Fill the reusable CO_2 absorber.
    c. Insert the disposable dust filter.
    d. Screw the absorber tight.
41. CLIC absorber (disposable absorber)
    a. Fit the CLIC absorber.

Fitting patient-specific accessories and consumables

42. Complete the device with the following accessories:
    - Breathing hoses
    - Breathing bag
    - Filter
    - Water trap
    - Sample line

Checking the operational readiness

43. Connect the device to the mains power supply and turn it on.
44. Perform a system test.

14 Service

14.1 Safety instructions

Intervals and implementation

Wear and material fatigue of the components may lead to device failure and malfunctions. If services activities are not performed regularly or properly, malfunctions may occur, which can result in personal injury and property damage.

- ► Perform service at the specified intervals.
- ► Service activities must be performed by those user groups that are assigned to the particular measure.
- ► Only perform service activities when there is no patient connected to the device.
- ► Before performing maintenance, disconnect all electrical connections from the power supply and all gas connections from the gas supply.
- ► Perform a system test after service activity.

Housing

Under the housing, there are live electrical components, which may cause an electric shock.

- ► The housing may only be opened by those user groups that are assigned to that particular measure.

Risk of infection

If the product has not been reprocessed properly, it may be contaminated with pathogens. As a result, persons could be put at risk.
Perform the following measure before servicing, before returning the device, and before disposal:

- ► Reprocess the product in accordance with the chapter "Reprocessing".

14.2 Definition of service terminology

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

A service contract with Dräger is recommended.

14.3 Inspection

Measure	Interval	User group
Inspection and safety check	Every 12 months	Service personnel

14.3.1 Remote service

The device supports the following remote service functions:

– Help Ticket
– Remote Device Check
– Proactive call

Further information on the remote service function can be obtained from Dräger.

14.3.2 Safety checks

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

14.3.2.1 Performing the safety checks

1. Check that the associated instructions for use are available in the correct version.
2. Perform a functional test of the following functions according to the instructions for use:
   – Emergency O_2 delivery
3. Check that the product is in good condition:
   – All labels are complete and legible
   – No visible damage to the following components:
      – Trolley and castors
      – Housing parts
      – Brakes
      – Vaporizer mount
      – Water trap and water trap mount
      – O-rings of the water trap mount
      – Sample line
      – Screen
      – Gas inlets
      – Status display
      – Breathing system
      – Piston drive and piston diaphragm
      – AGS and AGS valves
      – Hoses and cables
      – Strain relief for compressed gas hoses and cables
      – Option: Support arms
      – Option: Pressure reducers and their sensor cables
   – Fuses that are accessible from the outside are in compliance with the specified values.
   – Check that the country-specific labeling of the gas type matches the screen display.
   – Check the end stops of the support arms for patient monitors.
4. Check the electrical safety in accordance with the IEC 62353 standard.

5. Check the safety features:
   – Functional integrity of optical and acoustic alarm generators
   – O_2 switch on gas mixing unit (electronically controlled gas mixer)
   – Internal battery
   – Option: Check the function of the minimum O_2 delivery (mechanically controlled gas mixer).
6. Check the accuracy of the gas measurement based on a certified test gas concentration:
   – Anesthetic gas measurement:
     Isoflurane, 1 Vol%
     Sevoflurane, 1 Vol%
     Accuracy ±0.35 Vol%
   – N_2O measurement, 70 Vol%
     Accuracy ±7.6 Vol%
   – CO_2 measurement, 5 Vol%
     Accuracy ±0.83 Vol%
7. Check the accuracy of the O_2 measurement:
   – Ambient air 21 Vol%
     Accuracy ±3 Vol%
   – 100 Vol%
     Accuracy –5 Vol%
8. Check sample gas flow of the patient-gas measurement module:
   – Accuracy 200 ±20 mL/min
9. Check the patient-gas measurement module for leakage:
   – Leakage at –200 hPa (cmH_2O)
   – <20 hPa/min (cmH_2O/min)
10. Check the non-return valves in the central supply for leakage:
   – Leakage ≤20 mL/min
11. Check the operational readiness by means of a system test.
12. Option:
    Check the accuracy of the pressure gauge for the internal breathing system:
   – Accuracy 30 hPa (cmH_2O) ±10 hPa (cmH_2O)
13. Option:
    Check the inspiratory O_2 sensor:
   – Accuracy of the O_2 sensor
14. Option:
    Perform a visual inspection of both safety valves of the passive AGS for damage and soiling.

14.4 Maintenance

Component	Interval	Measure	User group
CO_2 absorber / soda lime with dust filter	When colored violet or according to the configured Infinity ID replacement interval	Replace, see page 75	Users
Water trap (option)	As required, when soiled, or according to the configured Infinity ID replacement interval	Replace, see page 77	Users
Flow sensors	As required, if calibration is no longer possible, or according to the configured Infinity ID replacement interval	Replace, see page 198	Users
Piston diaphragm	Annually	Replace, see page 236	Users
Inspiratory O_2 sensor (option)	Every 2 years	Replace, see page 55	Users
AGS	As required, when soiled	Replace	Specialized service personnel
AGS filter	If required, if filter is soiled, or flow is no longer achieved	Replace	Users
O-rings on the water trap mount (option)	Every 2 years	Replace	Service personnel
Pressure reducer (option)	Every 6 years	Replace	Specialized service personnel
Filter cloth – Above the gas mixer – Power supply unit	Every 2 years	Replace	Service personnel
CLIC adapter (option)	Every 4 years	Replace	Users
Lead-gel battery (2 pieces)	Every 2 years	Replace	Service personnel
	Or after determination of remaining capacity	Replace	Specialized service personnel

14.5 Repair

Repairs may only be performed by specialized service personnel.

It is recommended that only original parts from Dräger be used for repairs and that the repairs be performed by Dräger.

The replacement of the integrated patient-gas measurement module is described in the chapter "Replacing the patient-gas measurement module (PGM)" (see "Replacing the patient-gas measurement module (PGM)", page 196).

15 Disposal

15.1 Safety instructions

Risk of infection

If the product has not been reprocessed properly, it may be contaminated with pathogens. As a result, persons could be put at risk.
Perform the following measure before servicing, before returning the device, and before disposal:

► Reprocess the product in accordance with the chapter "Reprocessing".

15.2 Disposing of the device

The disposal of electrical and electronic devices is subject to special guidelines. This device must be disposed of in accordance with national regulations. In countries of the European Union, Dräger will organize the return of the device. Additional information is available at www.draeger.com (search term: WEEE).

15.3 Disposing of accessories

When disposing of the following accessories, follow the infection prevention policy of the hospital and the respective instructions for use:

– Flow sensors
– Breathing hoses
– Filter, HME, HMEF
– Breathing bag
– Masks
– Water trap
– CLIC absorber, Infinity ID CLIC absorber
– Soda lime

Dispose of the following items in accordance with the infection prevention policy of the hospital.

– Sample line
– Dust filter
– AGS

16 Technical data

16.1 Safety instructions

16.1.1 Electromagnetic compatibility (EMC)

Medical electrical equipment is subject to special precautionary measures concerning electromagnetic compatibility. During installation and before initial operation, follow the information in section: "EMC declaration" (page 291).

Electrostatic discharge

Measures to protect from electrostatic discharge must be adhered to when handling components carrying the ESD warning symbol. Otherwise, malfunctions may occur which could put the patient at risk.

To prevent malfunctions, observe the following measures and train the relevant personnel:

► Observe the ESD protective measures, e.g.:
  – Wear antistatic clothes and shoes.
  – Use gloves that are electrically insulating and antistatic.
  – When establishing connections, touch a potential equalization pin.
► Observe the requirements for the electromagnetic environment. Observe the following section: "Electromagnetic environment" (page 292).

Electromagnetic disturbances

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

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

Magnetic fields can adversely affect the functional integrity of the medical device and thus put the patient or user at risk.

► Do not use the medical device in rooms where devices for magnetic field applications are used (e.g., magnetic resonance imaging).

The medical device meets the applicable limit values for electromagnetic fields. The functioning of pacemakers can nevertheless be impaired by emissions.

► All wearers of pacemakers should maintain a distance of at least 25 cm (10 in) between pacemaker and medical device.

16.2 General information

Units of measurement for pressure	1 hPa = 1 mbar = 1 cmH_2O 100 kPa = 0.1 MPa = 1 bar = 1 kPa x 100
User's operating location	At the front at a distance of 1 m (39 in) and a height of 1.5 m (59 in)
Tolerances	All specified tolerances apply for ambient conditions of 20 °C (68 °F), 60 % relative humidity, and 1013 hPa (760 mmHg).
Accuracies	The accuracies indicated below change according to ambient pressure, temperature, and relative humidity. If one of the ambient conditions is changed up to the permissible limit, the accuracy can change by up to 50 %. If more than one of the ambient conditions is changed, the accuracy may change by up to 100 %. Example: Accuracy of a measured pressure value: ±4 % under standard conditions. At 10 °C, the accuracy changes to ±6 %; at 10 °C and 20 % relative humidity, to ±8 %.
Standardization	All patient-related volumes and flows are based on dry oxygen, converted to the conditions in the lungs (BTPS).

16.3 Ambient conditions

During operation

Temperature	10 to 40 °C (50 to 104 °F)
Ambient pressure	650 to 1060 hPa (9.5 to 15.3 psi)
Relative humidity	20 to 95 %, non-condensing
CO_2 concentration	300 to 1000 ppm
Height above sea level	Up to 3500 m (11483 ft)

During storage and transport

Temperature	
Device without battery	–20 °C to 60 °C (–4 °F to 140 °F)
Battery	–15 °C to 40 °C (5 °F to 104 °F)
For storage longer than 12 months	–15 °C to 25 °C (5 °F to 77 °F)
Maximum storage duration without recharging	180 days

16.3 Ambient conditions (continued)

Ambient pressure	500 to 1060 hPa (7.3 to 15.3 psi)
Relative humidity	10 to 95 %, non-condensing
CO_2 concentration	Not relevant
Information	The permissible ambient conditions depend on the accessories used. Follow the corresponding instructions for use.

16.4 Fresh-gas delivery

Gas mixer	The device is equipped with either an electronically controlled or a mechanically controlled gas mixer.
Standardization	All data are standardized to STPD conditions.
O_2 flush	25 to 75 L/min at 2.7 to 6.9 kPa x 100 (39 to 100 psi; 0.27 to 0.69 MPa) supply pressure
O_2 flow with integrated flowmeter	
Range	Off; 2 to at least 10 L/min at 2.7 kPa x 100 (39 psi or 0.27 MPa) supply pressure
Accuracy	±10 % of the set value for flows >2.0 L/min
Resolution of displayed value	1 L/min (up to 10 L/min) 5 L/min (starting at 10 L/min)
O_2 flow with external flowmeter	
Range	Off; 1 to at least 10 L/min at 2.7 kPa x 100 (39 psi or 0.27 MPa) supply pressure
Accuracy	±10 % of the set value
Resolution of displayed value	1 L/min (up to 10 L/min) 5 L/min (starting at 10 L/min)

16.5 Fresh-gas delivery with electronically controlled gas mixer

Standardization	All data are standardized to STPD conditions.
O_2 concentration FG O_2	
Setting range	21 to 100 Vol% (carrier gas: Air) 25 to 100 Vol% (carrier gas: N_2O)
Accuracy	±5 % or ±2 Vol% (the larger value applies)
Fresh-gas flow FG flow	
Setting range	Off; 0.2 to 15 L/min

16.5 Fresh-gas delivery with electronically controlled gas mixer (continued)

Information	The maximum flow specified under STPD conditions can drop linearly from 15 L/min at 750 hPa ambient pressure to 13.5 L/min at 620 hPa ambient pressure. At 620 hPa ambient pressure, an STPD flow of 13.5 L/min corresponds to an ATPD flow of 22 L/min.
Accuracy	±10 % or ±50 mL/min (the larger value applies)

16.6 Fresh-gas delivery with mechanically controlled gas mixer

Standardization	All data are standardized to STPD conditions.
O_2 concentration	21 to 100 Vol%
Setting range for fresh-gas flow	0 to at least 12 L/min (O_2, Air, and N_2O)
Electronic measurement of fresh-gas flow	
Range	0 to 15 L/min (O_2, Air, and N_2O)
Accuracy	±10 % or ±0.12 L/min (the larger value applies)
Resolution of the value displayed on the screen	0.01 L/min (from 0 to 0.2 L/min) 0.02 L/min (from 0.2 to 0.5 L/min) 0.05 L/min (from 0.5 to 1 L/min) 0.10 L/min (from 1 to 15 L/min)
Resolution of the value displayed in the status display	0.1 L/min
Total flow tube	
Standardization	All data are standardized to STPD conditions.
Range	0 to 10 L/min
Accuracy	±10 % of the set value at 100 % O_2 and for flows >1 L/min
Resolution of displayed value	0.5 L/min

16.7 Ventilator

Design	Electronically driven ventilator, fresh-gas decoupled
Time-based settings	
Respiratory rate RR	3 to 100 /min ±10 % of the set value or ±1 /min (the larger value applies)

16.7 Ventilator (continued)

Minimum respiratory rate RRmin in PSV mode	Off, 3 to 25 /min ±10 % of the set value or ±1 /min (the larger value applies)
Inspiratory time Ti	0.2 to 10 s ±5 % of the set value or ±150 ms (the larger value applies)
Maximum inspiratory time for assisted breaths (fixed setting)	4.0 s or 1 / (2 x RRmin) (the smaller value applies) for the "Adult" patient category 1.5 s or 1 / (2 x RRmin) (the smaller value applies) for the "Pediatric patients" and "Neonates" patient categories
Pressure rise time Slope	0 to 2 seconds; ±10 % of the set value or ±200 ms (the larger value applies)
Ratio of inspiratory time to expiratory time	1:50 to 50:1
Inspiration termination criterion Insp term	5 to 80 % ±20 % of the set value or ±2.5 L/min (the larger value applies)
Ratio of plateau time to inspiratory time % Tplat for mandatory breaths in the VC - CMV , VC - SIMV, and VC - SIMV / PS modes	0 to 60 % ±10 % of the set value or ±100 ms (the larger value applies)
Volume-based and flow-based settings	
Tidal volume VT	10 to 1500 mL (with "Advanced neonatal support" option: 5 to 1500 mL) ±10 % of the set value or ±10 mL (the larger value applies) in the range from 5 to 150 mL ±5 % of the set value or ±15 mL (the larger value applies) in the range from 151 to 1500 mL The applied tidal volume is adjusted automatically to compensate for the compliance of the breathing circuit. As soon as CO_2 respiratory phases are detected, the sample gas flow for the patient-gas measurement module is additionally compensated.
Trigger threshold Trigger	0.3 to 15 L/min ±20 % of the set value or ±1 L/min (the larger value applies)
Inspiratory flow Flow	Minimum 0.1 L/min, maximum >120 L/min Results from the set values for VT and Ti or Pinsp and Ti Applies for mains operation or in the first 5 minutes of battery operation with a fully charged battery.

16.7 Ventilator (continued)

Pressure-related settings

Inspiratory pressure Pinsp	PEEP +5 to 80 hPa (cmH_2O) ±10 % of the set value or ±3 hPa (cmH_2O) (the larger value applies)
Pressure limitation Pmax	PEEP +10 to 80 hPa (cmH_2O) ±10 % of the set value or ±3 hPa (cmH_2O) (the larger value applies)
Relative pressure support above PEEP ΔPsupp	Off, 3 to (80 - PEEP) hPa (cmH_2O) ±10 % of the set value or ±3 hPa (cmH_2O) (the larger value applies) in the CPAP / PSV and PC - SIMV / PS modes Off, 3 to (Pmax - PEEP) hPa (cmH_2O) ±10 % of the set value or ±3 hPa (cmH_2O) (the larger value applies) in the VC - SIMV / PS and VC - SIMV / PS / AutoFlow modes
Positive end-expiratory pressure PEEP	Off, 2 to 35 hPa (cmH_2O) ±10 % of the set value or ±2 hPa (cmH_2O) (the larger value applies)
Minimum pressure limit as per ISO 8835-5 and ISO 80601-2-13	-3 hPa (cmH_2O)

16.8 Breathing system

Total volume (when applying a maximum tidal volume of 1500 mL)

with CLIC absorber 800+ disposable CO_2 absorber	3.65 L ± 150 mL
with reusable CO_2 absorber and Drägersorb 800+	3.83 L ± 150 mL

Compliance (without breathing circuit)

In the Man / Spon mode (including disposable CO_2 absorber)	Typically 2.7 mL/hPa (mL/cmH_2O) corresponds to 81 mL at 30 hPa (cmH_2O) for the "Neonates" patient category Typically 2.8 mL/hPa (mL/cmH_2O) corresponds to 84 mL at 30 hPa (cmH_2O) for the "Pediatric patients" patient category Typically 3.0 mL/hPa (mL/cmH_2O) corresponds to 90 mL at 30 hPa (cmH_2O) for the "Adults" patient category

16.8 Breathing system (continued)

In mechanical ventilation modes	Typically 0.5 mL/hPa (mL/cmH_2O) corresponds to 15 mL at 30 hPa (cmH_2O) for the "Neonates" patient category Typically 0.8 mL/hPa (mL/cmH_2O) corresponds to 24 mL at 30 hPa (cmH_2O) for the "Pediatric patients" patient category Typically 2.0 mL/hPa (mL/cmH_2O) corresponds to 60 mL at 30 hPa (cmH_2O) for the "Adults" patient category
Filling volume of the CO_2 absorber	
Reusable CO_2 absorber	1500 mL ± 50 mL
Disposable CO_2 absorber CLIC absorber 800+	1300 mL ± 50 mL
Disposable CO_2 absorber CLIC absorber Free	1200 mL ± 50 mL
Flexible breathing bag arm	
Volume	0.11 L ± 50 mL
Compliance	0.11 ± 0.05 mL/hPa (mL/cmH_2O) corresponds to 3.3 ± 1.5 mL at 30 hPa (cmH_2O)
Rigid breathing bag arm	
Volume	0.13 L ± 50 mL
Compliance	0.13 ± 0.05 mL/hPa (mL/cmH_2O) corresponds to 3.9 ± 1.5 mL at 30 hPa (cmH_2O)
Total leakage	<150 mL/min at 30 hPa (cmH_2O) standardized to BTPS conditions
APL valve	
Setting range	Open, 5 to 70 hPa (cmH_2O)
Accuracy (at a flow of 20 ±1 L/min):	±20 % of the set value or ±3 hPa (the larger value applies), but not more than +10 hPa (cmH_2O)
Pressure drop at 30 L/min (ATPD), fully opened	Dry: 2.1 hPa (cmH_2O) Wet: 2.2 hPa (cmH_2O)
Recommendation for breathing hoses	
Information	All compliances and volumes specified include inspiratory and expiratory filters.
Neonate ventilation (typical VT <100 mL)	Maximum compliance: 2.0 mL/hPa (mL/cmH_2O)
Pediatric ventilation (typical VT between 50 and 300 mL)	Maximum compliance: 4.0 mL/hPa (mL/cmH_2O)

16.8 Breathing system (continued)

Adult ventilation (typical VT >200 mL)	Maximum compliance: 6.0 mL/hPa (mL/cmH_2O)
Maximum length	200 cm (78.7 in) 350 cm (137.8 in) (leads to limitations in compliance compensation and pressure accuracy)
Recommendation for a breathing bag hose (if no breathing bag arm is being used)	
Maximum length	180 cm (70.9 in) 350 cm (137.8 in) with increased fresh-gas consumption
Recommendation for the breathing bag size	
Volume	0.5 L to 5.0 L (at least double the value of the tidal volume)

16.9 External fresh-gas outlet

Connection	22 mm (outer taper), 15 mm (inner taper), ISO
Delivery	See "Fresh-gas delivery"
Pressure limitation	Not pressure-limited

16.10 Anesthetic gas receiving system (AGS)

Information	The device is equipped with an active or a passive anesthetic gas receiving system.

16.11 Active AGS

Information	This system is designed for connection to an anesthetic gas scavenging system which works with a suction flow.
Suction flow	
Normal range	30 to 50 L/min
At lower end of restricted range	≥10 L/min
Maximum fresh-gas flow to prevent contaminating ambient air	
For external breathing systems (normal range)	9 L/min
For external breathing systems (restricted range)	5 L/min

16.11 Active AGS (continued)

For internal breathing systems (restricted range)	7 L/min

Connection for sample gas disposal when using external patient-gas measurement

Outer hose diameter	3 to 6 mm
Maximum inlet flow	500 mL/min

16.12 Passive AGS

Information

This system is designed for an anesthetic gas scavenging system which works without suction flow. Do not connect it to an active anesthetic gas scavenging system.
To limit contamination of the ambient air in compliance with ISO 80601-2-13, follow the specifications for the scavenging hose.

Scavenging hose

Maximum length	8 m (26 ft)
Minimum diameter	19 mm (0.75 in)

Connection for sample gas disposal when using external patient-gas measurement

Outer hose diameter	3 to 6 mm
Maximum inlet flow	500 mL/min

16.13 Measuring systems and displays

Information

Alarms and internal calculations are based on values that are more precise than the displayed values. Consequently, there may be minor deviations between the current alarm status and the displayed measured values.

Airway pressure

Airway pressure	Paw
Plateau pressure	Pplat
Positive end-expiratory pressure	PEEP
Peak inspiratory pressure	PIP
Mean airway pressure	Pmean
Range	–20 to +99 hPa (cmH_2O)
Accuracy	±4 % of the measured value or ±2 hPa (cmH_2O) (the larger value applies)

16.13 Measuring systems and displays (continued)

Resolution of displayed value	1 hPa (cmH_2O)
Pressure gauge for indicating the pressure in the internal breathing system	
Range	–20 to +80 hPa (cmH_2O)
Accuracy	±5 % of the measured value or ±2 hPa (cmH_2O) (the larger value applies)
Resolution of displayed value	5 hPa (cmH_2O)
Volume	The measured volume values displayed already take account of the compliance of the breathing circuit. As soon as CO_2 respiratory phases are detected, the sample gas flow for the patient-gas measurement module is additionally taken into account.
Tidal volume	
Expiratory	VT
Range	0 to 2500 mL
Accuracy for gas measurement with PGM	±10 % of the measured value or ±15 mL (the larger value applies)
Accuracy without PGM	±20 % of the measured value or ±40 mL (the larger value applies)
Resolution of displayed value	1 mL
Difference between inspiratory and expiratory tidal volumes	ΔVT
Range	0 to 2500 mL
Accuracy for gas measurement with PGM	±20 % of the measured value or ±30 mL (the larger value applies)
Accuracy without PGM	±40 % of the measured value or ±80 mL (the larger value applies)
Resolution of displayed value	1 mL
Minute volume	
Total	MV
Mandatory	MVmand
Spontaneous	MVspon
Range	0 to 40 L/min
Accuracy for gas measurement with PGM	±10 % of the measured value or ±0.1 L/min (the larger value applies)
Accuracy without PGM	±20 % of the measured value or ±0.2 L/min (the larger value applies)
Resolution of displayed value	0.01 L/min (MV <1 L/min) or 0.1 L/min (MV ≥1 L/min)

16.13 Measuring systems and displays (continued)

$T_{0...90}$	<45 s (RR ≥6 /min) <105 s (RR <6 /min)
Leakage minute volume	MVleak
Range	0 to 40 L/min
Accuracy	±25 % of measured value or ±0.2 mL/min (the larger value applies)
Resolution of displayed value	0.01 L/min (MV <1 L/min) or 0.1 L/min (MV ≥1 L/min)

Low-flow wizard

Standardization	The following data are standardized to STPD conditions.
Range	0 to 8 L/min
Accuracy	±25 % of measured value or ±100 mL/min (the larger value applies)

Respiratory rate

Total	RR
Spontaneous	RRspon
Mandatory	RRmand
Range	0 to 100 /min
Accuracy	±10 % or ±1 /min (the larger value applies)
Resolution of displayed value	1 /min
$T_{0...90}$	<45 s (RR ≥6 /min) <105 s (RR <6 /min)

Dynamic compliance

Dynamic compliance	Cdyn
Mean dynamic compliance	Cdyn mean
Range	0 to 200 mL/hPa (mL/cmH_2O)
Accuracy for gas measurement with PGM	±15 % or ±1 mL/hPa (mL/cmH_2O) (the larger value applies)
Accuracy without PGM	±40 % or ±3 mL/hPa (mL/cmH_2O) (the larger value applies)
Information	The values may be distorted by spontaneous breathing, thus reducing the measurement accuracy.
Resolution of displayed value	0.1 mL/hPa (mL/cmH_2O)

Resistance	R
Range	0 to 100 hPa/L/s (cmH_2O/L/s)
Accuracy for gas measurement with PGM	±30 % of the measured value or ±3 hPa/L/s (cmH_2O/L/s) (the larger value applies)

16.13 Measuring systems and displays (continued)

Accuracy without PGM	±50 % of the measured value or ±5 hPa/L/s (cmH_2O/L/s) (the larger value applies)
Information	The values may be distorted by spontaneous breathing, thus reducing the measurement accuracy.
Resolution of displayed value	1 hPa/L/s (cmH_2O/L/s)
Elastance	E
Range	0.005 to 10 hPa/mL (cmH_2O/mL)
Resolution of displayed value	0.001 hPa/mL (cmH_2O/mL)
Supply pressures	
Central supply	
Range	0 to 9.8 kPa x 100 0 to 140 psi 0 to 0.98 MPa
Accuracy (up to 7 kPa x 100)	±4 % or ±0.2 kPa x 100 (the larger value applies) ±4 % or ±3 psi (the larger value applies) ±4 % or ±0.02 MPa (the larger value applies)
Resolution of displayed value	0.1 kPa x 100 1 psi 0.01 MPa
Gas cylinders	
Range	0 to 250 kPa x 100 0 to 3600 psi 0 to 25 MPa
Accuracy	±4 % or ±6 kPa x 100 (the larger value applies) ±4 % or ±87 psi (the larger value applies) ±4 % or ±0.6 MPa (the larger value applies)
Resolution of displayed value	1 kPa x 100 1 psi 0.1 MPa
Results in the system test	
Total leakage	
Range	10 to 5000 mL/min (measured at BTPS, referenced to a pressure of 30 hPa)
Accuracy	±25 % or ±150 mL/min (the larger value applies)
Resolution of displayed value	1 mL/min
Leakage during mechanical ventilation	
Range	10 to 1000 mL/min (measured at BTPS, referenced to a pressure of 30 hPa)

16.13 Measuring systems and displays (continued)

Accuracy	±25 % or ±50 mL/min (the larger value applies)
Resolution of displayed value	1 mL/min
Compliance of the breathing circuit	
Range	0 to 9.9 mL/hPa (mL/cmH_2O), measured at BTPS
Accuracy	±30 % or ±0.2 mL/hPa (mL/cmH_2O) (the larger value applies)
Resolution of displayed value	0.1 mL/hPa (mL/cmH_2O)

16.14 Gas measurement

Information	The device is equipped with a patient-gas measurement module (PGM) for O_2, CO_2, N_2O, and anesthetic agent, or with an O_2 sensor.

16.15 Gas measurement with PGM

Information	This is a sidestream gas measurement, in which the sample gas is fed back into the breathing system. End-tidal measured values are calculated for each breath from the local maxima and minima of the real-time measurements during expiration.
Standardization	All data are standardized to ATPS conditions.
Accuracies	Due to the $T_{10...90}$ time and the sample gas flow, the measurement accuracies for O_2, CO_2, N_2O, and anesthetic agent may deviate at respiratory rates of 60 /min or higher and an I:E ratio of 1:1. The influence of respiratory rate and the I:E ratio on the accuracy has been verified in a simulated breathing system using a rectangular waveform for the gas concentration.
Sample gas flow	200 mL/min ±10 % standardized to STPD conditions
Maximum time until emptying of the water trap is necessary	41 hours (sample gas under BTPS conditions and 23 °C ambient temperature)
System response time	The system response time results from the typical delay and the gas type specific $T_{10...90}$ time.
Sensor sampling rate	<50 ms
Time after switch-on until the specified accuracy is attained	<480 s

16.15 Gas measurement with PGM (continued)

Time until measured CO_2 values are displayed (with at least reduced accuracy)	<90 s
Typical delays	<5 s
Cross sensitivity	None with respect to alcohol (<3000 ppm in blood), Acetone (<1000 ppm), methane, water vapor, NO and CO
Drift	Compensated by automatic cyclic calibration
	During the automatic calibration, ambient air is fed to the breathing system and used as the sample gas.

O_2

Range	0 to 100 Vol%
Accuracy	±(2.5 Vol% + 2.5 % relative)
Resolution of displayed value	1 Vol%
$T_{10...90}$	<500 ms

CO_2

Range	0 to 13.6 Vol% 0 to 13.6 kPa 0 to 102 mmHg
Accuracy	±(0.43 Vol% + 8 % relative) ±(0.43 kPa + 8 % relative) ±(3.3 mmHg + 8 % relative)
Resolution of displayed value	0.1 Vol% 0.1 kPa 1 mmHg
$T_{10...90}$	<350 ms

N_2O

Range	0 to 100 Vol%
Accuracy	±(2 Vol% + 8 % relative)
Resolution of displayed value	1 Vol%
$T_{10...90}$	<500 ms

Anesthetic gases

Range	
Halothane	0 to 8.5 Vol% (kPa)
Isoflurane	0 to 8.5 Vol% (kPa)
Enflurane	0 to 10 Vol% (kPa)
Sevoflurane	0 to 10 Vol% (kPa)
Desflurane	0 to 20 Vol% (kPa)

16.15 Gas measurement with PGM (continued)

Accuracy	±(0.2 Vol% + 15 % relative) ±(0.2 kPa + 15 % relative)
Resolution of displayed value	0.1 Vol% (kPa) for desflurane 0.01 Vol% (kPa) for all other anesthetic gases
$T_{10...90}$	<500 ms
Anesthetic agent identification	Automatic
Primary gas	At the latest at 0.3 Vol%
Secondary gas	At the latest at 0.4 Vol% or 0.1 xMAC (the larger value applies) With a desflurane concentration greater than 4 Vol%, mixture detection occurs at the latest when the concentration of the second anesthetic gas rises above 10 % of the desflurane concentration. The secondary gas becomes the primary gas when the expiratory xMAC value is more than 0.2 xMAC above that of the primary gas.
Minimum displayed concentration	The specified detection thresholds refer to rising anesthetic gas concentrations (e.g., at the start of surgery). If the anesthetic gas concentration falls, a concentration of down to 0.05 Vol% will be measured, based on the last anesthetic agent detected. Below this concentration, a value of 0 Vol% will be displayed.
xMAC	Based on the age of the patient, the anesthetic gas concentration, and the nitrous oxide concentration (the xMAC value is corrected for ambient pressure)
Range	0 to 9.9
Accuracy	Refer to the accuracies of the respective measured gas values.
Resolution of displayed value	0.1

16.16 Gas measurement with O_2 sensor

Information	The oxygen measurement is performed in the inspiratory limb of the breathing system and is pressure-corrected.
Time after switch-on until the specified accuracy is attained	<180 s
Time after the insertion of the sensor cell until the specified accuracy is attained	<30 min
Replacement interval of the oxygen cell	2 years

16.16 Gas measurement with O_2 sensor (continued)

Cross sensitivity	None with respect to alcohol (<3000 ppm in blood), Acetone (<1000 ppm), methane, water vapor, NO and CO
Drift	Compensated by cyclic calibration with ambient air, at the latest every 7 days in the system test

O_2

Range	0 to 100 Vol%
Accuracy	±(2.5 Vol% + 2.5 % relative)
Resolution of displayed value	1 Vol%
Typical delays	<15 s

16.17 Display of calculated values

Measurement of consumption and elimination

CO_2 elimination per minute

Standardization	The following data are standardized to STPD conditions.
Range	0 to 9999 mL/min
Accuracy	±25 % or ±100 mL/min (the larger value applies)
Resolution of displayed value	1 mL/min

O_2 uptake per minute

Standardization	The following data are standardized to STPD conditions.
Range	0 to 9999 mL/min
Accuracy	±25 % or ±100 mL/min (the larger value applies)
Resolution of displayed value	1 mL/min

Anesthetic agent uptake

Range	0 to 99.9 mL fluid
Accuracy	±25 % or ±1 mL (the larger value applies)
Resolution of displayed value	0.1 mL

Fresh-gas consumption

Standardization	The following data are standardized to STPD conditions.
Range	0 to 99999 L

16.17 Display of calculated values (continued)

Information	Gas consumption related to O_2 flush and O_2 therapy is not included in this calculation.
Accuracy	±15 % or ±2 L/min (the larger value applies)
Resolution of displayed value	1 L

Anesthetic agent consumption

Range	0 to 999.9 mL fluid
Accuracy	±25 % or ±1 mL (the larger value applies)
Resolution of displayed value	0.1 mL
Waveforms	O_2 concentration Primary anesthetic gas concentration CO_2 concentration Airway pressure Volume (only for loops) Flow
Sweep speed	6.25; 12.5; 25.0 mm/s

Scale

Airway pressure	–20 to 80 hPa (cmH_2O)
Flow	–120 to 120 L/min
Volume	0 to 2000 mL
O_2	0 to 100 Vol%
CO_2	0 to 100 mmHg (0 to 12 Vol%, 0 to 12 kPa)

Anesthetic agent

Halothane	0 to 5 Vol% (kPa)
Enflurane	0 to 6 Vol% (kPa)
Isoflurane	0 to 5 Vol% (kPa)
Sevoflurane	0 to 10 Vol% (kPa)
Desflurane	0 to 20 Vol% (kPa)
Loops	Pressure-Volume Flow-Volume

16.18 Operating characteristics

Mains power supply

Mains voltage	100 to 240 V AC at 50/60 Hz
Maximum power consumption	4 A

Power cable

Maximum length	5 m (16.4 ft)
Protective ground resistance	Maximum 0.1 Ω

16.18 Operating characteristics (continued)

Operating voltage	≥250 V
Operating current	≥10 A
Current consumption at 230 V AC	
Standby (without charging the internal battery)	<0.18 A
During mechanical ventilation (PC - CMV, Pinsp = 15 hPa, RR = 8 /min, I:E = 1:2, PEEP = 0 hPa, FG flow 4 L/min O_2) without charging the internal battery	<0.40 A
Maximum	2 A
Current consumption at 110 V AC	
Standby (without charging the internal battery)	<0.38 A
During mechanical ventilation (PC - CMV, Pinsp = 15 hPa, RR = 8 /min, I:E = 1:2, PEEP = 0 hPa, FG flow 4 L/min O_2) without charging the internal battery	<0.84 A
Maximum	4 A
Power consumption	
Standby (without charging the internal battery)	<40 W
During mechanical ventilation (PC - CMV, Pinsp = 15 hPa, RR = 8 /min, I:E = 1:2, PEEP = 0 hPa, FG flow 4 L/min O_2) without charging the internal battery	<95 W
Maximum	400 W
Peak inrush current	Approx. 8 to 14 A Approx. 6 to 10 A quasi-RMS
Internal battery	
Type	Lead-gel battery Sealed, maintenance-free
Capacity	7.2 Ah
Voltage	24 V
Fuse	F15A 80V UL248-14, breaking capacity 1000 A, size 19.7 mm x 19 mm x 5 mm
Current	Maximum 15 A
Backup time with new and fully charged battery	
During mechanical ventilation (PC - CMV, Pinsp = 15 hPa, RR = 8 /min, I:E = 1:2, PEEP = 0 hPa, FG flow 4 L/min O_2)	At least 45 min Typically 120 min
During ventilation in Man / Spon	At least 90 min
Charging time (to achieve at least 30 minutes' backup time)	At least 8 hours

16.18 Operating characteristics (continued)

Charging power	Maximum 50 W
Gas supply	
Gas quality	
Oil content	<0.1 mg/m^3
Dew point	5 °C (41 °F) at ambient temperature
Particle size	Dust-free air (filtered with pore size <1 µm)
Supply pressure for O_2, Air, N_2O	2.7 to 6.9 kPa x 100 39 to 100 psi 0.27 to 0.69 MPa
Maximum short-term peak inlet flow at 6.9 kPa x 100 (100 psi or 0.69 MPa) supply pressure	
O_2	135 L/min (applies only when there is no distribution piece for the central O_2 supply)
Air	
Without bronchial suction system	50 L/min
Including a directly connected bronchial suction system	130 L/min
N_2O	40 L/min
Drive gas	Not needed
Gas supply connection	Depending on configuration: NIST, DISS (CGAV-5/B or CGAV-5/N), French standard (NFS90-116)
Gas cylinders (dimensions)	
Diameter	100 to 140 mm (3.94 to 5.51 in) for versions with upright gas cylinders 100 to 102 mm (3.94 to 4.01 in) for versions with hanger yoke system for gas cylinders with pin-index connections
Maximum height	880 mm (34.64 in) for versions with upright gas cylinders 757 mm (29.80 in) for versions with hanger yoke system for gas cylinders with pin-index connection
Pressure reducers	
Version	Conforms to DIN EN ISO 10524-1
Permissible inlet pressure (P_V)	
Air, O_2	Up to 200 kPa x 100 (2900 psi, 20 MPa)
N_2O	Up to 60 kPa x 100 (870 psi, 6 MPa)

16.18 Operating characteristics (continued)

Noise emissions from device	Free field measurements complying with ISO 3744
Equivalent sound pressure level Leq(A) during ventilation with typical settings	≤42 dB(A)
Sound pressure L(A) of the alarm tones at the user's operating location, measured according to IEC 60601-1-8	
Acoustic alarm signal	
Alarm volume (all priorities)	Settable from >45 dB(A) to <75 dB(A)
Secondary acoustic alarm signal and mains power supply failure alarm	≥55 dB(A) and ≤75 dB(A)
Dimensions of the compact version (may deviate with accessory equipment)	
Width	863 mm (33.98 in)
Height	1403 mm (55.24 in)
Depth	717 mm (28.23 in)
Dimensions of the large version (may deviate with accessory equipment)	
Width	933 mm (36.74 in)
Height	1403 mm (55.24 in)
Depth	750 mm (29.53 in)
Dimensions of the work surface on the compact version	
Width	Approx. 470 mm (18.50 in)
Depth	Approx. 380 mm (14.96 in)
Dimensions of the work surface on the large version	
Width	Approx. 710 mm (27.95 in)
Depth	Approx. 380 mm (14.96 in)
Additional pull-out work surface (width x depth)	Approx. 340 mm (13.39 in) x 245 mm (9.65 in)
Weight of the compact version	
Nominal configuration consisting of mechanically controlled gas mixer, plug-in connector for 2 vaporizers, breathing system, CLIC adapter and CLIC absorber, breathing hoses, central supply hoses (5 m (16.4 ft)), scavenging hose (5 m (16.4 ft))	Approx. 135 kg (298 lbs) without counterweight Approx. 170 kg (375 lbs) with the "Counterweight for increased maximum total weight" option
Permissible total weight without counterweight	270 kg (595 lbs)
Permissible total weight with counterweight	330 kg (727 lbs)

16.18 Operating characteristics (continued)

Weight of the large version

Nominal configuration consisting of mechanically controlled gas mixer, plug-in connector for 3 vaporizers, breathing system, CLIC adapter and CLIC absorber, breathing hoses, central supply hoses (5 m (16.4 ft)), scavenging hose (5 m (16.4 ft))	Approx. 160 kg (353 lbs)
Permissible total weight	330 kg (727 lbs)

Touchscreen color screen

Screen diagonal	Approx. 39 cm (15.3 in)
Background illumination	LED
Resolution	1280 x 768 pixels

RFID system

Operating frequency	13.56 MHz ± 50 ppm (wideband)
Transmitter power	≤42 dBµA/m (200 mW ± 1 dB)
Modulation	ASK (amplitude shift keying)
Electromagnetic compatibility	Tested in compliance with IEC 60601-1-2

Protection classes

Device	I, in compliance with IEC 60601-1
Applied parts (connections for breathing hoses)	TYPE BF
Degree of protection	IP20 according to IEC 60529, meets ISO 80601-2-13
Classification in compliance with Directive 93/42/EEC, Annex IX	II b
UMDNS code	10-134
Use of latex	The device is made without natural rubber latex.

16.19 Interfaces and ports

Serial ports	COM 1 and COM 2
Information	Only connect devices that meet the requirements of IEC 60950-1 for ungrounded SELV circuits and the requirements of IEC 60601-1 (as of the 2nd edition) for touchable secondary circuits with a maximum nominal voltage of 24 V DC. Use COM2 to connect devices for external patient-gas measurement with the MEDIBUS communication protocol.

16.19 Interfaces and ports (continued)

Protocol	MEDIBUS.X
Alarm delay time	Typically <2 s
Connector	9-way Sub-D
Baud rate	1200, 2400, 4800, 9600, 19200, 38400 baud
Data bits	8
Parity	Even
Stop bits	1
Pin assignment	
Pin 1	Not used
Pin 2	RXD
Pin 3	TXD
Pins 4, 6	Pins 4 and 6 are connected internally
Pin 5	SHLD-GND
Pins 7, 8	Pins 7 and 8 are connected internally
Pin 9	Not used
Housing	SHLD-GND
USB port	Only connect USB mass storage devices that do not have their own power supply. Do not connect any charging cables.
Type	USB connector type A; USB 2.0
Supported devices	USB flash drive formatted with FAT16 or FAT32. Dräger recommends USB mass storage devices with encryption conforming to FIPS 140-2 and their own encryption facility.
Network port	Only for Dräger Remote Service Only connect devices or networks that meet the requirements of IEC 60950-1 for ungrounded SELV circuits and the requirements of IEC 60601-1 (as of the 2nd edition) for touchable secondary circuits with a maximum nominal voltage of 24 V DC.
Type	RJ45 plug
Transfer speed	100Base-TX, IEEE 802.3 Clauses 24 and 25 (requires at least a CAT5 cable) 10BASE-T, IEEE 802.3 Clause 14 (requires at least a CAT3 cable)
Connector for external workplace light	Only for workplace lights approved by Dräger, see list of accessories.

16.19 Interfaces and ports (continued)

Distribution piece for central O_2 supply (optional)	
Supply pressure	2.7 to 6.9 kPa x 100 39 to 100 psi 0.27 to 0.69 MPa
Maximum permissible flow	20 L/min

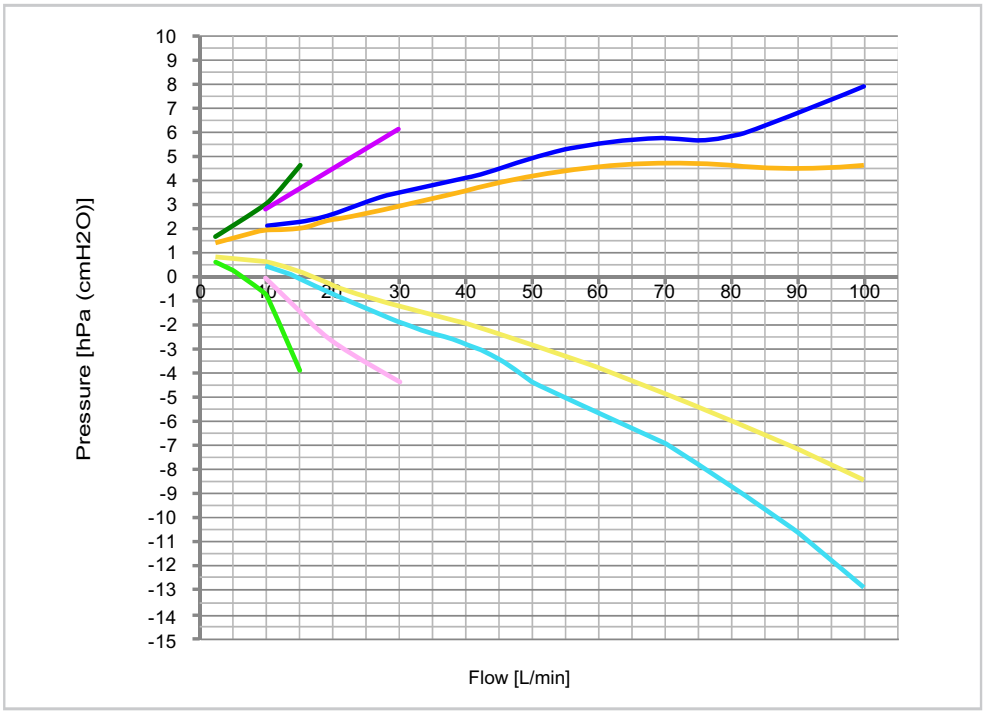
16.20 Relevant standards

Information	In addition to the standards listed here, this medical device also meets various other standards, e.g., standards concerning special national requirements.
IEC 60601-1 Medical electrical equipment	Part 1: General requirements for basic safety and essential performance
IEC 60601-1-2 Medical electrical equipment	Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic disturbances - Requirements and tests
IEC 60601-1-8 Medical electrical equipment	Part 1-8: General requirements for basic safety and essential performance - Collateral standard Alarm systems - General requirements, tests and guidance for alarm systems in medical electrical equipment and medical electrical systems
IEC 60601-2-13 Medical electrical equipment	Part 2-13: Particular requirements for the safety of anaesthetic systems
ISO 8835-2 Systems for inhalational anesthesia	Part 2: Anesthesia breathing systems
ISO 8835-3 Systems for inhalational anesthesia	Part 3: Transfer and receiving systems of active anaesthetic gas scavenging systems
ISO 8835-4 Systems for inhalational anesthesia	Part 4: Anesthetic vaporizers
ISO 8835-5 Systems for inhalational anesthesia	Part 5: Anesthesia ventilators
ISO 21647 Medical electrical equipment	Particular requirements for the basic safety and essential performance of respiratory gas monitors

16.21 Diagrams

16.21.1 Pressure characteristics and flow characteristics of the breathing system

Breathing system with and without breathing hoses and filters (conforming to ISO 8835-2 and ISO 80601-2-13):



- Pexp [hPa (cmH2O)] with neonatal breathing hose
- Pexp [hPa (cmH2O)] with pediatric breathing hose
- Pexp. [hPa (cmH2O)] with adult breathing hose
- Pexp. [hPa (cmH2O)] without breathing hoses
- Pinsp [hPa (cmH2O)] with neonatal breathing hose
- Pinsp [hPa (cmH2O)] with pediatric breathing hose
- Pinsp [hPa (cmH2O)] with adult breathing hose
- Pinsp [hPa (cmH2O)] without breathing hoses

Breathing system, dry, with filled reusable CO_2 absorber and soda lime dust filter MX50115	**Peak flow in use [L/min]**	**Resistance [hPa (cmH2O)]**	
		Man / Spon	
		Inspiratory	**Expiratory**
Without breathing circuit and inspiratory filter	60	–3.8	4.5
	30	–1.2	2.9
	15	0.0	2.0
	2.5	0.7	1.6

Breathing system, dry, with filled reusable CO_2 absorber and soda lime dust filter MX50115	Peak flow in use [L/min]	Resistance [hPa (cmH_2O)]	
		Man / Spon	
		Inspiratory	Expiratory
With breathing circuit for **adults** MP00349, inspiratory filter MP01730	60	–5.6	5.5
	30	–2.0	3.4
With breathing circuit for **pediatric patients** MP01340 and MP01343, inspiratory filter MP01815	15	–1.6	3.5
With breathing circuit for **neonates** MP00333, inspiratory filter MP01815	2.5	0.6	1.8

16.21.2 Response times in event of concentration changes

Typical response times ($T_{0..90}$) for an oxygen concentration change from 21 Vol% to 100 Vol% at the following fresh-gas flows:

	2 L/min	4 L/min	8 L/min	O_2 flush
Test lung for adults (MP02400), breathing circuit (MP00300), breathing bag 2 L (MP00222) ***VT***=500 mL, ***RR***=10 /min, ***I:E***=1:2	712 s	174 s	32 s	9 s
Test lung for neonates (8410079), breathing circuit (MP00333), breathing bag 1 L (MP00383) ***VT***=30 mL, ***RR***=30 /min, ***I:E***=1:1	91 s	64 s	46 s	7 s

16.22 EMC declaration

16.22.1 General information

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

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

16.22.2 Electromagnetic environment

This device may only be used in environments specified in section "Environments of use" on page 10.

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

NOTICE

The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required), this equipment might not offer adequate protection to radio-frequency communication services.

► The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

Immunity against	Test level and required electromagnetic environment
Electrostatic discharge (ESD) (IEC 61000-4-2)	Contact discharge: ±8 kV
	Air discharge: ±15 kV
Fast transient electrical disturbances (bursts) (IEC 61000-4-4)	Power cable: ±2 kV
	Longer signal input lines/output lines: ±1 kV
Impulse voltages (surges) (IEC 61000-4-5)	Voltage, external conductor – external conductor: ±1 kV
	Voltage, external conductor – protective ground conductor: ±2 kV
Magnetic fields at mains frequency (IEC 61000-4-8)	50 Hz: 30 A/m
Voltage dips and short interruptions in the supply voltage (IEC 61000-4-11)	Voltage dips of 30 % to 100 %, 8.3 ms to 5 s, different phase angles
Radiated high-frequency disturbances (IEC 61000-4-3)	80 MHz to 2.7 GHz: 3 V/m
Conducted high-frequency disturbances (IEC 61000-4-6)	150 kHz to 80 MHz: 3 V, ISM bands: 6 V
Electromagnetic fields in the vicinity of wireless communication devices	Various frequencies from 385 MHz to 5785 MHz: 9 V/m to 28 V/m

16.22.3 Recommended separation distances from wireless communication devices

To ensure that the full functional integrity of this device is not compromised, there must be a separation distance of at least 1.0 m (3.3 ft) between this device and wireless high-frequency communication equipment.

16.23 Device combinations

This device can be operated in combination with other Dräger devices or with devices from other manufacturers. Follow the accompanying documents of the individual devices.

If a device combination is not approved by Dräger, the safety and the functional integrity of the individual devices can be compromised. The operating organization must ensure that the device combination complies with the applicable editions of the relevant standards for medical devices.

Device combinations approved by Dräger meet the requirements of the following standards:

- IEC 60601-1, 3rd edition (general requirements for safety, device combinations, software-controlled functions)
  - IEC 60601-1-2: 3rd edition (electromagnetic compatibility) or 4th edition (electromagnetic interference)
  - IEC 60601-1-8 (alarm systems)

Or:

- IEC 60601-1, 2n edition (general requirements for safety)
  - IEC 60601-1-1 (device combinations)
  - IEC 60601-1-2 (electromagnetic compatibility)
  - IEC 60601-1-4 (software-controlled functions)
  - IEC 60601-1-8 (alarm systems)

16.24 Emission of high-frequency energy

This medical device is equipped with an RFID module (radio frequency identification) to enable wireless communication with Infinity ID accessories.

This medical device has been designed and manufactured to comply with emission limit values for high-frequency energy. These limit values are incorporated in international safety standards such as IEC 60601-1-2 and standards for radio equipment such as EN 300330 and have been defined by regulatory authorities.

The RFID system of this medical device complies with Part 15 of the FCC regulations and the license-free RSS regulations of Industry Canada. Operation is subject to the following 2 conditions:

1. This medical device does not cause any harmful interference.
2. The medical device is not liable to damage caused by the reception of interference, including interference causing undesired operating conditions.

Changes and modifications that have not been expressly approved by Dräger may result in the user no longer being permitted to operate the device.

Dräger hereby declares that this medical device, including its radio equipment, is in compliance with Directive 2014/53/EU.

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

16.25 Connections to IT networks

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

Connecting this device to a network that incorporates other devices or making subsequent changes to that network can lead to new risks for patients, users, and third parties. Before the device is connected to the network or the network is changed, these risks must be identified, analyzed, and evaluated by the hospital IT representative in accordance with the IEC 80001-1 standard (risk management for medical IT networks). Appropriate measures must be taken on the basis of the results.

Examples of subsequent changes to the network:

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

16.25.1 LAN interface

16.25.1.1 Service

In conjunction with the Dräger SCG (ServiceConnect Gateway) or a DrägerService computer, the LAN interface enables the following functions:

– Using the SNMP protocol:
  Monitoring the service status of the device, querying the service status, support during the installation of device software and during software download, configuration support
– Using the FTP protocol (as a client):
  Querying the device status, support during the installation of device software and during software download, configuration support

The following personal data are transmitted unencrypted over the interface:

– Logbook with details of age, weight, and height of the patient

16.25.1.2 Time synchronization

The LAN interface allows synchronization with an NTP (Network Time Protocol) server using the NTP protocol.

16.25.1.3 Required characteristics

The LAN must be securely isolated from other networks and no devices may be connected that could be potential sources for malicious attacks.

The LAN must ensure the connection between the device and the following destinations:

– ServiceConnect Gateway or DrägerService Computer:
– NTP server

Connections between Atlan and corresponding destinations						
Function	**Proto-col**	**Atlan port**	**Direction**	**Remote port**	**Remote partner**	**Connec-tion**
SNMP V3	UDP	161	⟷	>1023	SCG	
TCP SNMP V3 (Trap)	UDP	>1023	→	162	SCG	
FTP (command)	TCP	>1023	→	21	SCG	New, estab-lished
FTP (command)	TCP	>1023	←	21	SCG	Estab-lished
FTP (data)	TCP	>1023	→	>1023	SCG	New, estab-lished
FTP (data)	TCP	>1023	←	>1023	SCG	Estab-lished
SNTP	UDP	>1023	⟷	123	NTP server	
DHCP	UDP	67	⟷	67	DHCP server	

Typical data volume:

– Update of device firmware: Typically 50 MB
– Help ticket (system logbook for service purposes): Typically 3 MB

While the service functions are being used, the device can cause network loading up to the maximum transmission speed of the LAN interface. The bandwidth used during normal use is negligibly low.

16.25.1.4 Hazardous situations

The following hazardous situations may occur if the network does not possess the required characteristics:

– Exported patient-related data (age, weight, height) and therapy-related data may be intercepted, falsified, or damaged.
– An overload of the device due to high network loading (e.g., caused by denial-of-service attacks) may lead to a shut-down of the device-side network interface. The interface will not be available again until the device is restarted.

16.25.2 RS-232 ports

The RS-232 port supports the MEDIBUS.X protocol. MEDIBUS.X is a communication protocol for data exchange between the device and, e.g., the following external medical or non-medical equipment:

– Hemodynamic monitor
– Data management system
– Computer
– RS232 to Ethernet converter

The transferred data include the following information:

– Settings
– Measured values which comply with the specified accuracy
– Waveforms
– Text messages
– Alarm status

If the specified accuracy for measured values cannot be met, these measured values will be displayed on the screen in gray. These measured values will not be transmitted over MEDIBUS.X.

Take note of the documentation for the following communication protocols before transferring the data:

– MEDIBUS.X, Rules and Standards for Implementation (9052607)
– MEDIBUS.X, Profile Definition for Data Communication V1.n (9052608)

The documents are only available in English.

The following personal data are transmitted unencrypted over the interface:

– Therapy data with details of age, weight, and height of the patient

With the aim of improving the clinical process, the data can be used to set up a distributed alarm system with unconfirmed alarm transmission conforming to IEC 60601-1-8. However, the data must not be used as a substitute for Atlan as the primary alarm source.

16.25.2.1 Required characteristics

The RS-232 port is a point-to-point connection. A connected device must prevent access by unauthorized users to the data that are sent over the RS-232 port and must itself be protected from infections by malware and computer viruses.

16.25.3 USB port

The USB port supports the transfer of data to external storage media. Existing data on external storage media may be deleted during this operation.

The following personal data are transmitted unencrypted over the interface:

– User logbook with details of age, weight, and height of the patient
– Screenshots potentially showing information about the age, weight, and height of the patient

16.25.3.1 Required characteristics

A connected device must conform to the mass storage medium USB device class (e.g., connecting devices to charge the battery is not intended.). Dräger recommends the use of FIPS 140-2 compatible storage media with hardware encryption.

16.25.3.2 Hazardous situations

Connecting active devices to the Atlan USB port can cause Atlan to restart.

16.26 Open-source software

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

www.draeger.com/opensource

17 Principles of operation

17.1 Safety instructions

Infinity ID components

It is only possible to use the additional functions of Infinity ID accessories if the device has the additional functions for replacement interval monitoring and anti-interchange security.

The use of these additional functions does not ensure the maximum period of use for the accessories and any correctly connected hoses. The user is thus not excused from regularly checking the accessories. If these accessories are not checked, the patient may be put at risk.

- ► Use the appropriate Infinity ID accessories to utilize the additional functions.
- ► Check the current condition and the period of use of the accessories regularly.
- ► Check regularly that the hoses are correctly connected.

There are product-specific data saved on the Infinity ID accessories, which are further processed by the device. If an unused Infinity ID accessory is in the immediate vicinity of the device, values such as those for resistance and compliance may be transferred inadvertently from this accessory. When accessories are added to an Infinity ID breathing circuit, the values for compliance and leakage may deviate from those saved on the breathing circuit.

- ► Do not keep unused Infinity ID accessories in the vicinity of the device.
- ► To determine the actual values for compliance and resistance, always perform the leakage test before starting the therapy. If the test cannot be performed because the patient is already connected, particular attention is required during ventilation.

17.2 Description of the ventilation modes

17.2.1 Meaning and function of the therapy controls

Therapy controls	Meaning / Function
% Tplat	Plateau time as a percentage of the inspiratory time Ti in the VC - CMV mode
RR	Respiratory rate
RRmin	Minimum respiratory rate at which supported breaths are applied in Pressure Support mode.
Insp term	When the flow falls below this flow value (in % of the measured peak flow), a supported breath is interrupted.
PEEP/CPAP	Positive end-expiratory pressure / Continuous Positive Airway Pressure Pressure that is always maintained.
ΔPsupp	Pressure difference of an assisted breath between PEEP level and inspiratory pressure This pressure support is only available if synchronization of spontaneous breathing (SIMV and in PSV mode) is switched on. When pressure support is switched on, the naming of the following ventilation modes changes:

Without pressure support	With pressure support
PC - SIMV	PC - SIMV / PS
VC - SIMV	VC - SIMV / PS
VC - SIMV / AutoFlow	VC - SIMV / PS / AutoFlow
CPAP / PSV	PSV

Pinsp	Inspiratory pressure
Pmax	Upper pressure limit in volume-controlled ventilation. When this pressure is reached, the breath is held at this level until the set inspiratory time Ti is reached.
Trigger	Flow that, when exceeded, triggers a supported breath.
Ti	Inspiratory time
Slope	Period of time during which a pressure rise from the PEEP or CPAP pressure to the inspiratory pressure or PSV pressure takes place. This time determines the steepness of the rise in pressure from the lower to the upper level.
VT	Tidal volume

<table>
<tr><th>Therapy controls</th><th>Meaning / Function</th></tr>
<tr><td>SIMV/CMV</td><td>Switching spontaneous respiratory support on / off
Switching the synchronization on or off causes the following change to the ventilation mode:<table><tr><th></th><th>Pressure-controlled</th><th>Volume-controlled</th></tr><tr><td>SIMV</td><td>PC - SIMV</td><td>VC - SIMV</td></tr><tr><td>CMV</td><td>PC - CMV</td><td>VC - CMV</td></tr></table>When synchronization is switched on, mandatory breaths are synchronized with the patient's inspiratory effort. In doing so, the respiratory rate RR is held constant by adapting the mandatory breaths and the expiratory time. At the end of the expiratory phase, an inspiratory trigger window is activated so that the mandatory breath can be initiated prematurely by up to 5 seconds (patient category Adult) or 1.5 seconds (patient categories Ped and Neo). If the spontaneous inspiratory flow reaches the set value of the flow trigger Trigger during this trigger window, a premature mandatory breath is triggered.
If no spontaneous breathing is detected within the inspiratory trigger window, a mandatory breath will be triggered immediately afterwards.</td></tr>
</table>

17.2.2 Degree of respiratory support

Respiratory support	Ventilation mode
None	Standby, Pause, Ext. FGO
Low	Man/Spon, CPAP, CPAP / PSV with ΔPsupp <5 hPa (cmH_2O)
Medium	CPAP / PSV with ΔPsupp ≥5 hPa (cmH_2O)
High	Volume-controlled modes Pressure-controlled modes

17.2.3 Ventilation modes and effective parameters

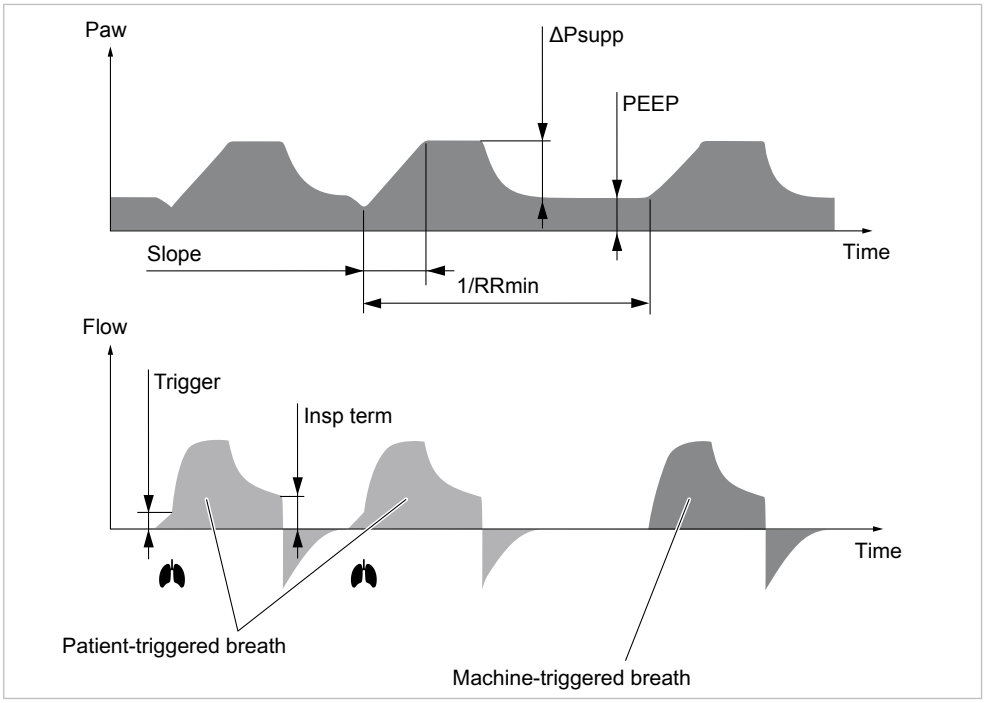
Group	Tabs	Ventilation mode	Basic parameter (normal therapy bar)	Additional parameters (expanded therapy bar)
Manual ventilation/spontaneous breathing	Man/Spon	Manual / Spontaneous	CPAP[1)]	
Assisted ventilation	PSV[1)]	CPAP / PSV	Trigger ΔPsupp RRmin PEEP Slope	Insp term
Pressure-controlled ventilation	PC	PC - CMV	Pinsp RR PEEP Ti CMV	Slope
		PC - SIMV	Pinsp ΔPsupp[1)] = Off RR PEEP Ti SIMV	Trigger Slope
		PC - SIMV / PS[1)]	Pinsp ΔPsupp[1)] >0 RR PEEP Ti SIMV	Trigger Insp term[1)] Slope

Group	Tabs	Ventilation mode	Basic parameter (normal therapy bar)	Additional parameters (expanded therapy bar)
Volume-controlled ventilation	VC - AF	VC - CMV / AutoFlow	Pmax VT RR PEEP Ti CMV	Slope
		VC - SIMV / AutoFlow	Pmax VT RR PEEP Ti SIMV	Trigger ΔPsupp[1)] = Off Slope
		VC - SIMV / PS / AutoFlow[1)]	Pmax VT RR PEEP Ti SIMV	Trigger ΔPsupp[1)] >0 Insp term[1)] Slope
	VC	VC - CMV	Pmax VT RR PEEP Ti CMV	% Tplat
		VC - SIMV	Pmax VT RR PEEP Ti SIMV	Trigger ΔPsupp[1)] = Off % Tplat
		VC - SIMV / PS[1)]	Pmax VT RR PEEP Ti SIMV	Trigger ΔPsupp[1)] >0 Insp term[1)] Slope % Tplat

1) Requires the PSV option

17.2.4 Assisted ventilation with pressure support

17.2.4.1 PSV



17.2.4.2 CPAP / PSV

– Spontaneous breathing
– Spontaneous breathing with continuous positive pressure level with or without pressure support

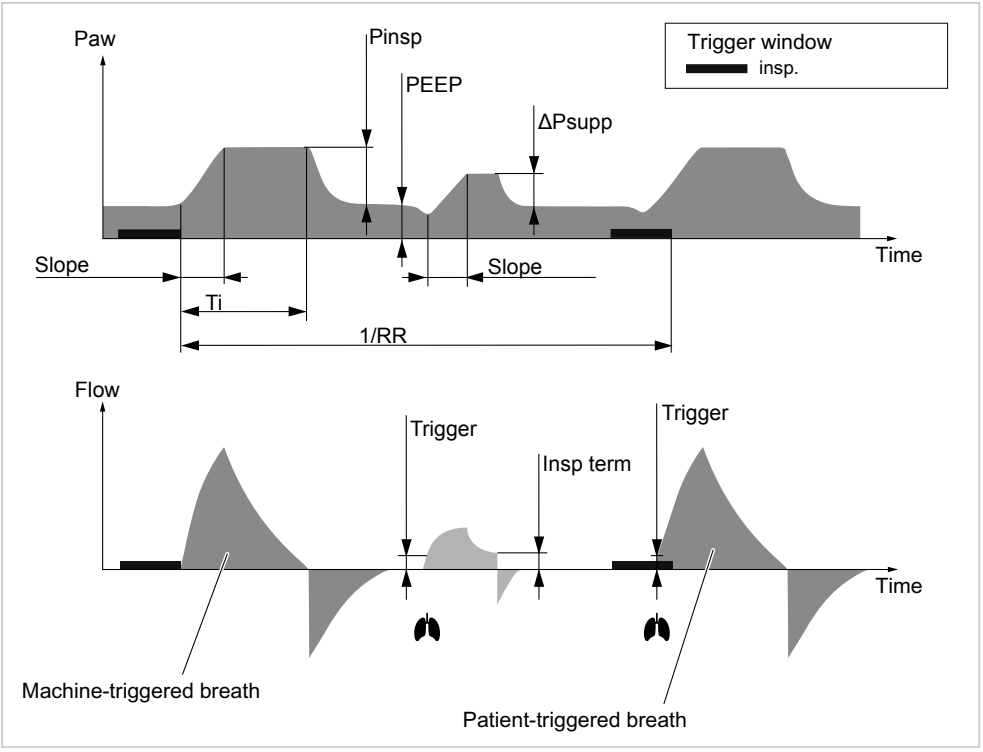
Each detected inspiratory effort at CPAP level induces a patient-triggered, flow-controlled, and pressure-supported breath. Point in time, number, and duration of pressure-supported breaths are controlled by the patient. When no inspiratory effort is detected, mandatory breaths are delivered at the set minimum respiratory rate RRmin and with pressure support ΔPsupp.

Patient-triggered breaths are ended as soon as the inspiratory flow falls below the flow defined by the Insp term setting. The duration of a machine-triggered breath is additionally defined by the patient category and the set minimum respiratory rate RRmin.

Purely spontaneous breathing at CPAP level can be achieved by setting ΔPsupp to Off. In this case, the patient does not receive any more pressure-supported breaths and RRmin does not trigger any more mandatory breaths.

17.2.5 Pressure-controlled ventilation

17.2.5.1 PC



17.2.5.2 PC - CMV

– Pressure-controlled
– Time-controlled
– Machine-triggered

The mandatory breaths are machine-triggered and are not triggered by the patient.

17.2.5.3 PC - SIMV

– Pressure-controlled
– Time-controlled
– Machine-triggered
– Synchronized inspiration

In PC - SIMV, the patient can breathe spontaneously at any time, while the number of mandatory breaths is predefined. When synchronization is switched on, the breaths are adapted to the spontaneous breathing efforts of the patient. If spontaneous breathing effort by the patient is detected during the inspiratory trigger window, a patient-triggered breath will be initiated.

17.2.5.4 PC - SIMV / PS

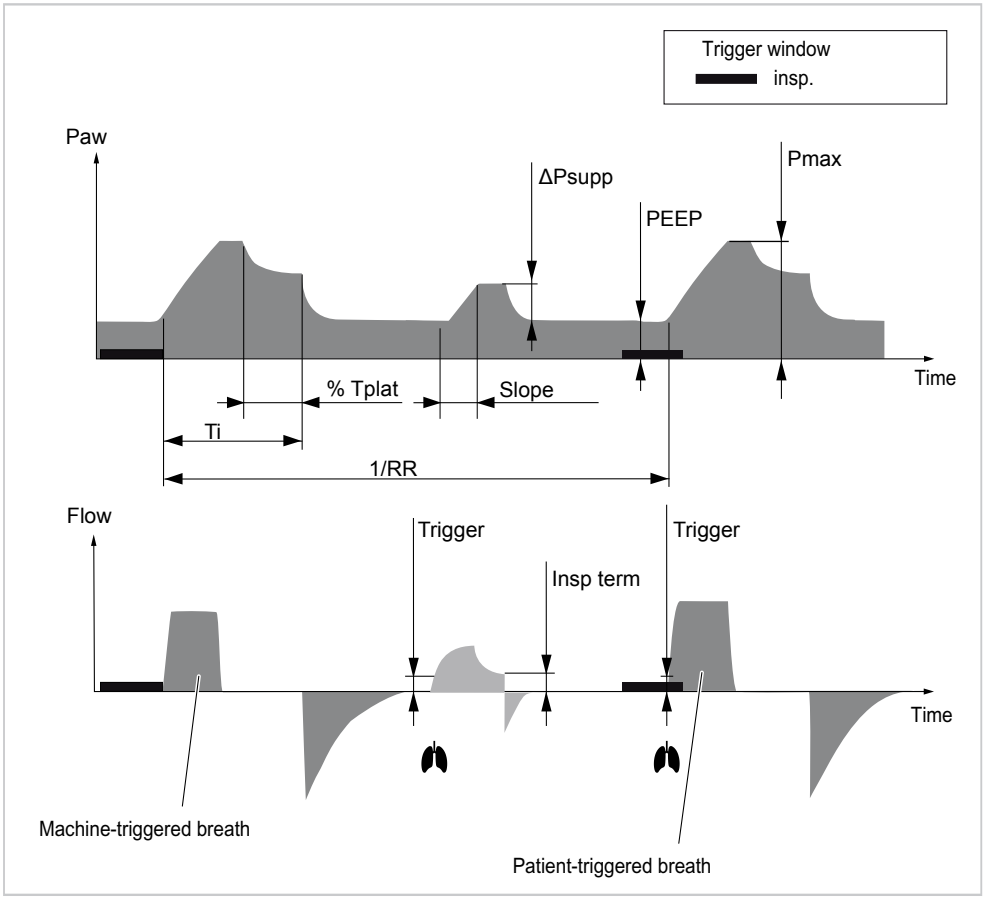
This mode is similar to PC - SIMV, except that the patient's spontaneous breathing at the PEEP level during the expiratory phase is pressure-supported with ΔPsupp when outside the trigger window.

17.2.6 Volume-controlled ventilation

17.2.6.1 Compliance compensation

The applied VT is corrected by the determined breathing hose compliance, i.e., an additional volume is delivered in order to ensure the application of the volume to the patient. On the product variant with the integrated patient-gas measurement module, the applied VT is corrected by the amount of suction flow as soon as CO_2 respiratory phases are detected.

17.2.6.2 VC



17.2.6.3 VC - CMV

- Volume-controlled
- Pressure-limited
- Time-controlled
- Machine-triggered
- Constant inspiratory flow

In this volume-controlled ventilation mode, the patient receives the set tidal volume VT with each mandatory breath.

17.2.6.4 VC - SIMV

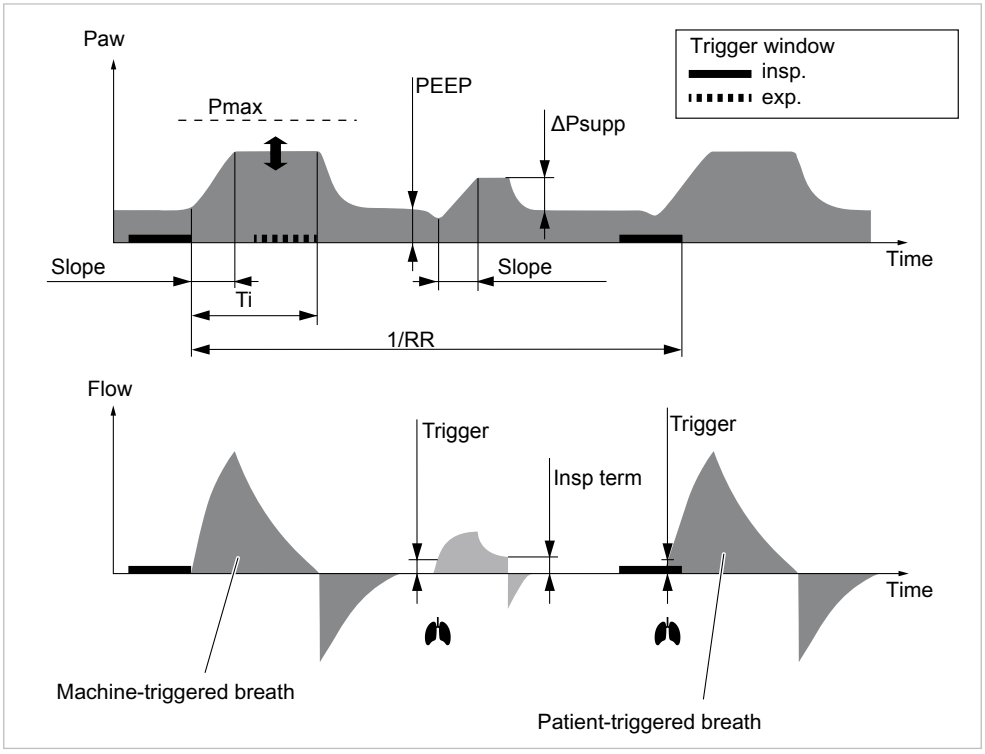
– Volume-controlled
– Pressure-limited
– Time-controlled
– Machine-triggered or patient-triggered
– Constant inspiratory flow
– Synchronized inspiration

In VC - SIMV, the patient can breathe spontaneously at any time, while the number of mandatory breaths is predefined. When synchronization is switched on, the breaths are adapted to the spontaneous breathing of the patient. If inspiratory effort by the patient is detected during the inspiratory trigger window, a patient-triggered breath will be initiated.

17.2.6.5 VC - SIMV / PS

This mode is similar to VC - SIMV, except that the patient's spontaneous breathing at the PEEP level during the expiratory phase is pressure-supported with ΔPsupp when outside the trigger window.

17.2.6.6 VC - AF



With AutoFlow, the set tidal volume VT is applied for all mandatory volume-controlled breaths with the lowest required pressure. The pressure patterns and flow patterns of the mechanical inspiratory breaths correspond to those of pressure-controlled ventilation.

Due to the patient's inspiratory effort or compliance changes in the lungs, the tidal volume in an individual breath may deviate from the set tidal volume VT. However, averaged over time a tidal volume corresponding to the set volume VT is applied.

If no mechanical ventilation has previously taken place, a volume-controlled test breath with constant inspiratory flow is performed first when starting a ventilation mode with AutoFlow in order to estimate the lung parameters. The inspiratory pressure required at the start is determined from this test breath. Each additional breath-related readjustment of the inspiratory pressure is limited to ±3 hPa (cmH_2O). The pressure difference (inspiratory pressure - PEEP) is at least 5 hPa (cmH_2O) and the upper inspiratory pressure limit is set by Pmax. If the set value for VT is reduced, the inspiratory pressure will be reduced by a greater amount if necessary.

17.2.6.7 VC - CMV / AutoFlow

- Volume-controlled
- Pressure-limited
- Time-controlled
- Machine-triggered
- Decelerating inspiratory flow

The mandatory breaths are machine-triggered and are not triggered by the patient.

17.2.6.8 VC - SIMV / AutoFlow

- Volume-controlled
- Pressure-limited
- Time-controlled
- Machine-triggered or patient-triggered
- Decelerating inspiratory flow
- Synchronized with inspiration and expiration

In VC - SIMV / AutoFlow, the patient can breathe spontaneously at any time, while the number of mandatory breaths is predefined. When synchronization is switched on, the breaths are adapted to the spontaneous breathing efforts of the patient. If spontaneous breathing effort by the patient is detected during the inspiratory trigger window, a mandatory breath will be initiated. If an exhalation by the patient is detected during the expiratory trigger window, the expiration will be initiated.

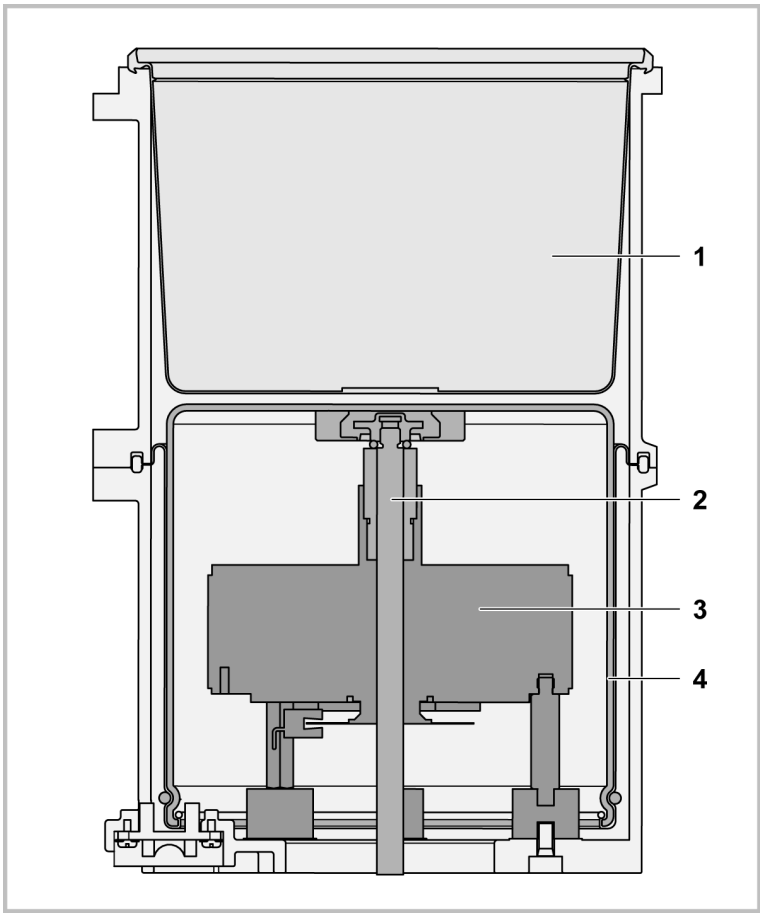
17.2.6.9 VC - SIMV / PS / AutoFlow

This mode is similar to VC - SIMV / AutoFlow, except that the patient's spontaneous breathing at the PEEP level during the expiratory phase is pressure-supported with ΔPsupp when outside the trigger window.

17.3 Description of the ventilation drive

17.3.1 Principle of operation

The device has a piston drive.



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No.	Designation
1	Piston diaphragm
2	Spindle
3	Electric motor
4	Piston

The piston drive is connected directly to the breathing system. The electric motor (3) moves the piston (4) by means of a spindle (2). Thus, the fresh gas is moved out of the piston diaphragm and through the breathing system to the patient.

The user can check through a viewing window whether the piston is moving. During inspiration, the ventilator applies the tidal volume with the required pressure and at a defined respiratory rate.

This principle of operation enables the following characteristics, for example:

– Precise application of the set tidal volume, regardless of the inspiratory and expiratory flow measurement.
– No drive gas is required, i.e., no medical gases are consumed in operating the ventilator.
– Mechanical ventilation remains available if the gas supply fails, see page 40.

17.3.2 Compliance compensation

The volume delivered into the breathing circuit is not the same as the volume that the patient ultimately receives. The determining factors for this difference in volume are the elasticity of the breathing circuit and the compressibility of the gas contained within it.

When the pressure in the breathing hose rises during inspiration, there is also expansion of the hose material. The expanding breathing hose can hold a greater volume, with the result that a lesser volume reaches the patient.

This device is equipped with dynamic compliance compensation, which compensates for this volume difference during each breath. Volume is also fed to the entire system so that the set tidal volume actually reaches the patient.

The basis for the compliance compensation is the breathing hose compliance determined in the system test or in the leakage test.

17.3.3 Fresh-gas decoupling

The device is equipped with fresh-gas decoupling.

This function decouples the ventilation from the fresh-gas flow and the O_2 flush. Consequently, changes to the fresh-gas flow have no influence on the applied tidal volume and the ventilation pressures. Furthermore, the fresh-gas decoupling valve passes excess fresh gas to the breathing bag.

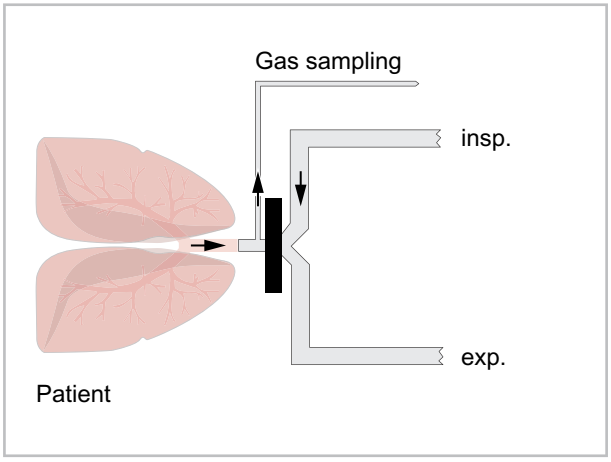
Fresh-gas decoupling is particularly important during the ventilation of neonates and pediatric patients as airway pressures and tidal volumes that are too high must be avoided.

17.4 Improving the CO_2 measurement by means of an HME filter

17.4.1 Benefits of the HME filter

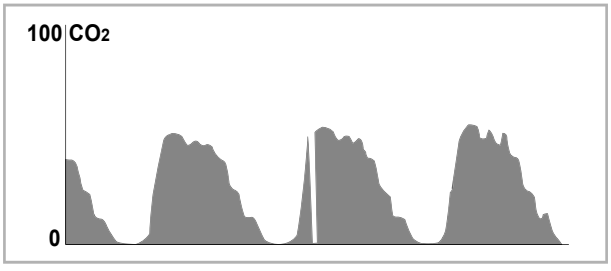
Patient-side gas sampling via an HME filter has the following benefits, among others:

– The sample gas measurement (e.g., CO_2) is more reliable, since it is not impaired by the influence of the ventilation.
– The potential dead space is minimized. This is particularly important when ventilating neonates and pediatric patients, in order that effective gas exchange can take place even at small tidal volumes.
  The unwanted effects of the dead space are reduced by removing the extracted CO_2-containing gas from the patient and the breathing circuit including the HME at the end of the expiration.



41098

As a consequence, the CO_2 waveform may fall at the end of the expiration before the inspiration is executed, in contrast to the normal course of the waveform.



37888

The unusual waveform shape results from the small dead space. The measured values derived from the CO_2 waveform are nevertheless correct, as the etCO_2 value corresponds to the maximum expiratory value and is not subject to the waveform fluctuations.

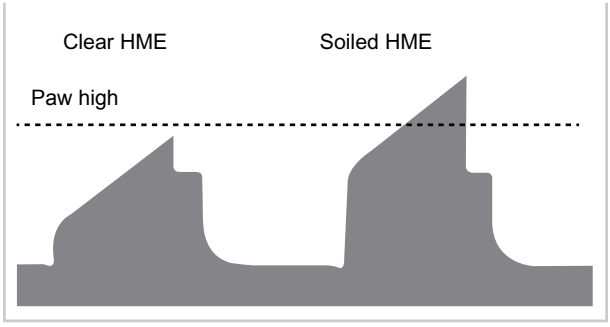
17.4.2 Reasonable alarm settings

If the HME is clogged or soiled, the suction flow for the gas measurement may cause negative pressure in the patient's lungs. To detect imminent clogging of the HME (e.g., by sputum), set the alarm limits for MV low and Paw high to suitable values.

Volume-controlled ventilation modes (also with AutoFlow)

If the HME filter is clear, set the alarm limit for Paw high closely above the peak inspiratory pressure (PIP). If the HME is clogged or soiled, the Paw high alarm will be triggered due to the increased resistance.

The following graphic illustrates the Paw high alarm limit as a suitable indicator in the event of a soiled filter:



Pressure-controlled ventilation modes

If the HME is clear, set the expiratory alarm limit MV low closely below the measured MV. If the HME is clogged or soiled, the MV low alarm will be triggered due to the smaller applied and measured expiratory tidal volume VT.

Increasing air trapping (recognizable on the flow waveform as an incompletely concluded expiration before the start of the next inspiration) indicates a clogging HME filter. The transparent HME housing allows visual checking of the amount of sputum. If there are signs (alarm, air trapping, visual check) which suggest clogging of the HME, check the HME and replace it if in doubt.

17.5 Minimum O_2 delivery

The device is equipped with a minimum O_2 delivery function which ensures that a minimum quantity of oxygen is delivered.

Gas mixer	Minimum FG O_2 concentration		Minimum O_2 flow
	Carrier gas Air	Carrier gas N_2O	
Electronically controlled	21 %	25 %	Configurable for each patient category, see chapter "Vertical tab "Fresh gas" (only with electronically controlled gas mixer)" When the minimum O_2 delivery switches on, the ***FG O_2*** therapy control is selected in addition to the selected therapy control. When the active set value is changed, ***FG O_2*** changes automatically with it.

Gas mixer	Minimum FG O_2 concentration		Minimum O_2 flow
	Carrier gas Air	Carrier gas N_2O	
Mechanically controlled	21 %	21 %	Continuously adjustable with flow control valves. The minimum O_2 delivery interrupts the N_2O flow in the following cases: – N_2O flow control valve open and O_2 flow control valve closed – O_2 flow less than 200 mL/min O_2 will continue to be delivered in the event of an N_2O failure.

17.6 Influence of patient category, weight, and age on device behavior

17.6.1 Influence of patient category

– Alarm limits and start settings for therapy
– Volumeter scale
– Flow measurement and software algorithms to suppress artifacts
– Maximum duration of a pressure-supported breath

17.6.2 Influence of ideal body weight and height

Ideal body weight describes the portion of the body that is relevant to setting the ventilation parameters (body weight of the patient minus assumed excess fat).

In the ***Adult*** and ***Ped*** patient categories, the ideal body weight is calculated from the entered body height.

In the ***Neo*** patient category, the ideal body weight is equal to the entered body weight.

The calculated ideal body weight affects the following:
– Start settings for tidal volume ***VT***
– Start settings for respiratory rate ***RR***
– Start settings for alarm limits for ***VT*** and ***MV***
– Ventilation algorithms
– Trigger threshold (insp. synchronization of the mandatory breaths)
– Sensitivity and resolution of the volume monitoring
– Rate of concentration changes affecting the patient

For neonates, the patient category and the ideal body weight must be set with particular care.

VT and ***RR*** are only dependent on the ideal body weight when the ***Ideal body weight*** function has been selected in ***System setup*** > ***Therapy***, see page 172.

Changing the body weight during mechanical ventilation has no effect on the current ventilation settings.

17.6.3 Influence of patient age

During operation, the set age influences the following:

– Calculation of MAC value

17.7 Support of Infinity ID accessories

The following accessories can be used if the device has the appropriate options:

– Infinity ID breathing circuit
– Infinity ID WaterLock 2 water trap
– Infinity ID flow sensors
– Infinity ID CLIC absorber

The Infinity ID functionality can be configured, see page 180.

17.7.1 Infinity ID functionality

17.7.1.1 Replacement interval monitoring

Automatic monitoring of the period of use is available for Infinity ID products. An exceeded period of use is signaled during the system test.

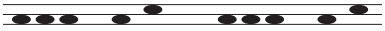
The replacement interval for the connected Infinity ID accessories can be adjusted. This interval must be specified in accordance with the applicable infection prevention regulations or the requirements stated in the instructions for use for the corresponding accessory.

17.7.1.2 Anti-interchange security

When Infinity ID breathing hoses and Infinity ID breathing bags are used, the incorrect connection of breathing hoses and the breathing bag is detected and reported. Hoses that are incorrectly connected with the breathing system trigger an automatic alarm.

17.8 Schematic illustration of the acoustic signals

17.8.1 Alarm signal for various alarm priorities

Alarm priority	Standard (according to IEC 60601-1-8)	Repeated
Warning	 Depending on the overall alarm situation, this acoustic alarm signal may also be played as only a 5-tone sequence due to the timing of the individual alarms.	Yes
Caution		Yes
Note		No

The described acoustic alarm signals are handled by a backup loudspeaker if the primary acoustic alarm system fails. It plays the acoustic alarm signals of the "Warning" and "Caution" alarm priorities at a constant tone frequency and unchanged volume.

17.8.2 Tone signals during operation

When	Signal
Therapy start or change of ventilation mode	
Timeout	

18 Annex

18.1 Abbreviations

Abbreviation	Explanation
%, Vol %	Percentage gas ratio, related to total volume
A	Ampere
Add. O2	Emergency O2 delivery
AGS	Anesthetic gas receiving system
AGSS	Anesthetic gas scavenging system
Air	Medical compressed air
APL	Adjustable Pressure Limitation
ASA	American Society of Anesthesiologists
ATPS	Ambient Temperature and Pressure, Saturated
Aux. O2	O2 insufflation
BIPAP	Biphasic Positive Airway Pressure, spontaneous breathing under continuous positive airway pressure with 2 different pressure levels
BMI	Body mass index
BTPS	Body Temperature and Pressure, Saturated 37 °C (98,6 °F), ambient pressure, 100 % relative humidity
CAL	Display when a measurement value is calibrated.
CBM mode	Cardiac bypass mode
Cdyn	Dynamic compliance (patient)
CISPR	Comité International Spécial des Perturbations Radioélectriques International special committee on radio interference
cmH2O	Centimeters of water
CMV	Controlled Mandatory Ventilation
CO	Carbon monoxide
CO2	Carbon dioxide
COM	Serial port
CPAP	Continuous Positive Airway Pressure
CSA	Canadian Standards Agency
dB(A)	Sound pressure level, A-weighted
Des	Desflurane
ΔO2	Difference between inspiratory and expiratory O2 concentration
ΔPsupp	Pressure support above ***PEEP***
EMC	Electromagnetic compatibility
Enf	Enflurane
ERR	Display when a measured value cannot be determined.
ESD	Electrostatic Discharge

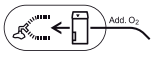
Abbreviation	Explanation
FG	Fresh gas
FiO_2	Inspiratory oxygen fraction
FTP	File Transfer Protocol
GPL	General Public Licence
Hal	Halothane
HF	High-frequency
HME	Heat and moisture exchanger
HMEF	HME filter
hPa	Hectopascal
Hz	Hertz
I:E	Ratio of inspiratory time to expiratory time
ID	Identification
Insp term	Inspiration termination criterion in % based on peak inspiratory flow
Iso	Isoflurane
kg	Kilogram
kPa	Kilopascal
L	Liter
LAN	Local area network
lbs	Pound; unit of mass
LED	Light-emitting diode
LGPL	Lesser General Public Licence
MAC	Minimum Alveolar Concentration
Man/Spon Manual / Spontaneous	Manual ventilation / Spontaneous breathing
mbar	Millibar
MEDIBUS.X	Communication protocol for medical devices with uniform data definition for all devices
min	Minute
mL	Milliliter
mmHg	Millimeter of mercury
MPa	Megapascal
MV	Minute volume
N_2O	Nitrous oxide
NTP	Network Time Protocol, standard for synchronizing clocks
O_2	Oxygen
O_2+	***O_2*** flush
Pa	Pascal; unit of pressure
Paw	Airway pressure

Abbreviation	Explanation
PEEP	Positive end-expiratory pressure
PGM	Patient-gas measurement module
Pinsp	Inspiratory pressure
PIP	Peak inspiratory pressure
Pmax	Maximum pressure
Pmean	Mean pressure
png	Graphics format
Pplat	Plateau pressure
ppm	Parts per million
QR code	Quick Response Code
R	Resistance
RFID	Radio Frequency Identification
RR	Respiratory rate
RRmin	Minimum respiratory rate
Sev	Sevoflurane
Slope	Pressure rise time
SNMP	Simple Network Management Protocol
STAPD	Standard Temperature, Ambient Pressure, Dry 20 °C (68 °F), dry gas
STPD	Standard Temperature and Pressure, Dry 20 °C (68 °F), 1013 hPa
TC	Time constant
Ti	Inspiratory time
UMDNS	Universal Medical Device Nomenclature System Nomenclature for medical devices
USB	Universal Serial Bus
V	Volt
VT	Tidal volume
xMAC	Accumulated multiple of the MAC values of anesthetic agents and N_2O

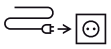
18.2 Symbols

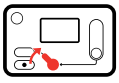
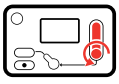
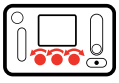
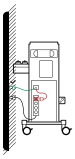
Additional information about the symbols is available on the following web page: www.draeger.com/md-symbols

Symbol	Explanation
	Manufacturer
	Date of manufacture
	WEEE marking
	Observe the instructions for use
	Warning! Strictly follow these instructions for use
	Caution! Follow the accompanying documentation (Symbol)
	Attention! (safety sign)
	Risk of tipping over! Do not take hold of the device above this mark in order to push it or pull it.
	Group ***Views...***
	Group ***Trends/Data...***
	Group ***Alarms...***
	Group ***Procedures...***
	Group ***System setup...***
	Group ***Start.../Standby...*** Device on/***Standby***
	Key: Start/Standby
	Main switch off/on
	Main switch on
	Main switch off
	Patient category ***Neo***
	Patient category ***Ped***

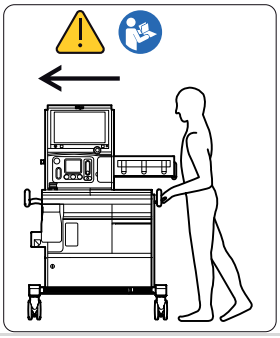
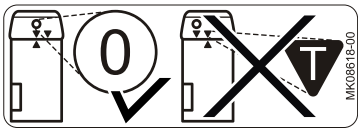
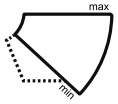
Symbol	Explanation
	Patient category ***Adult***
	Acoustic alarm signal is temporarily suppressed.
	Alarm silence
	Alarm inactive
	Alarm temporarily inactive
	Mains power
	Mains power unavailable
	Battery completely charged
	Battery empty
	Central supply connected and pressure within specified range
	Central supply not connected or pressure not within specified range
	Gas cylinder full
	Gas cylinder empty or gas cylinder valve turned off
	Gas cylinder pressure sensor not connected
	Oxygen cylinders on this side of the device only
	No oxygen cylinders on this side of the device
	Key for switching on and off and dimming the workplace illumination
	Emergency O2 delivery (***Add. O2***)
	Applied part of type BF (body floating)
	Potential equalization connector
	Closes the dialog
	Upper alarm limit
	Lower alarm limit
– –	No alarm limit

Symbol	Explanation
	Spontaneous breathing activity by the patient
	In lists: One line up
	In lists: One line down
	In lists: One page up
	In lists: One page down
	Risk of crushing
	ESD warning label, follow the information on electromagnetic compatibility.
	ESD label, follow the information on electromagnetic compatibility.
	Locked
	Unlocked
	Inspiration Labeling on breathing system and breathing system cover
	Expiration Labeling on breathing system and breathing system cover
	Breathing bag
	Vaporizer plug-in system, "fixed" position
	Auto Exclusion Plug-in connection
REF	Part number
SN	Serial number
LOT	Lot number
	Use by: YYYY-MM-DD Expiration date
	Hot surface
	Do not touch the device
	Keep away from sunlight
	Storage temperature
	Relative humidity

Symbol	Explanation
	Ambient pressure
	Do not use if package damaged
	Do not reuse
	Spare part
	LAN connection
	USB port
	Identifies the interface for the workstation light
	External fresh-gas outlet
	CO_2 absorber bypass
	Enter key
*	Indicates a changed view which has not yet been saved
	Identifies the tabs that lead to the page with the language settings.
	Read the flow at the center of the float.
	Advanced Cylinder Support
	Identifies N_2O cylinders. The color code conforms to the locally applicable standard.
	Identifies O_2 cylinders. The color code conforms to the locally applicable standard.
	Identifies Air cylinders. The color code conforms to the locally applicable standard.
	Maintain the correct minimum distance between electrical connectors and gas cylinders, see product label on the device.
	Electrical connector on the device
	When connecting auxiliary devices, be aware of the leakage current. Observe chapters "Assembly and preparation" and "Technical data".
	Gas outlet
	Gas inlet

Symbol	Explanation
Total	Display on the total flow tube indicating the cumulative value of the individual flows
	MR unsafe Do not use this device in the vicinity of MRI scanners.
	Example representation of the weight distribution of the nominal weight and the maximum total weight, see "Technical data".
	Weight: Main device
	Weight: Load
	Label: Do not place any weight on this surface of the device.
	Activate backup manual mode.
	Switch to "Add. O_2".
	Set fresh gas on O_2 flowmeter.
	Set fresh-gas flow.
	Ventilate manually.
	Check vaporizer setting.
	Backup manual mode
	Direct connection from mains supply to device

18.3 Product labels

Product label	Explanation
	Transport instructions (see "Intrahospital transport", page 59)
	Ensure that the control dial of the vaporizer is correctly positioned. Do not leave the control dial in the "***T***" position while the vaporizer is connected to the medical device.
	Observe the correct flow of the anesthetic gas receiving system (see "Anesthetic gas receiving system", page 145).

18.4 Overview of the menu structure

The following tables list the buttons of the main menu bar with the resulting dialogs of the same name and the tabs. For further information see: "Operating concept", page 79. The structure of the main screen and the dialogs is clarified on pages 79 and 80.

Group △			
Button in main menu bar	**Horizontal tab**	**Vertical tab**	**Description**
Alarms...	***Limits***		Display or change alarm limits.
	Current alarms		Display information on active alarms.
	Logbook		View alarm logbook.
	Settings		Set the alarm volume. Activating or deactivating CO_2 alarms[1)2)]. Switch CBM mode on or off[1)].
CO_2 alarms off [1), 3)]			Deactivate CO_2 alarms.
Autoset limits [1), 4)]			Automatically adapt alarm limits to current measured or set values.
Exit CBM [1), 5)]			Exit CBM mode.

1) Only during operation, not in ***Standby*** mode
2) Only available for the device equipped with integrated patient-gas measurement module
3) Only in the modes: ***Manual / Spontaneous***, ***Ext. FGO***, ***Pause***
4) Only in the modes: ***PSV***, ***PC***, ***VC - CMV / AutoFlow***, ***VC - CMV***
5) Only in CBM mode

Group ▭			
Button in main menu bar	**Horizontal tab**	**Vertical tab**	**Description**
Views...[1)]			Switch to other configured views. Reset current view to start setting. Display alarm limits, units, mini-trends, and loops.
View[1)] ***View***[1)] ***View***[1)]			Switching between the 3 configured views.
Export screenshot			Export screenshot to a USB mass storage device.

1) Only during operation, not in ***Standby*** mode

Group 🔍

Button in main menu bar	Horizontal tab	Vertical tab	Description
Trends/Data...	***Graphical trends***	***Overview***	Display trends of measured values in graphic form.
		Vent. 1	
		Vent. 2	
		Anesthesia	
	Tabular trends	***Overview***	Display trends of measured values in table form.
		Vent. 1	
		Vent. 2	
		Anesthesia	
	Values	***Ventilation*** 1)	Display overview of current measured values.
		Gases 1)	
		Device	
	Logbook		Display the logbook.
	Export 2)		Export data to a USB mass storage device.

1) Only during operation, not in ***Standby*** mode
2) Only in ***Standby*** mode

Group 📋

Button in main menu bar	Horizontal tab	Vertical tab	Description
System setup...			Configure device functions and start settings, see page 166.
Patient... 1)			Set patient data.
Tests... 2)			Display test results. Test the system.

1) Only during operation, not in ***Standby*** mode
2) Only in ***Standby*** mode

Group ⏻

Button in main menu bar	Horizontal tab	Vertical tab	Description
Start... 1)			Begin or continue a case.
Standby...2)			End the case.

1) Only in ***Standby*** mode
2) Only during operation, not in ***Standby*** mode

19 Password

19.1 Configuration password for Atlan A300, A300 XL, A350, A350 XL Software 1.0n

Cut out from the instructions for use Atlan A300, A300 XL, A350, A350 XL Software 1.0n

To prevent unauthorized alteration, the start settings for Atlan A300, A300 XL, A350, A350 XL are protected by the following configuration password:

0000

19.1.1 Information for the configuration password

To prevent unauthorized alteration, the start settings for Atlan A300, A300 XL, A350, A350 XL are protected by a password with 0 to 8 digits. Information on the start settings, see page 166.

The configuration password appears on this page of the instructions for use.

► Cut out the area with the password and keep in a place which is safe from access by unauthorized persons.

The configuration password can only be reset by specialized service personnel.

This page has been left blank intentionally.

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These instructions for use only apply to
Atlan A300, A300 XL, A350, A350 XL SW 1.0n
with the Serial No.:
If no serial number 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 medical device.
These instructions for use are provided for customer information only and will only be updated or exchanged upon customer request.

CE 0123

Directive 93/42/EEC concerning medical devices

CE

Directive 2014/53/EU concerning radio equipment

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