Instructions for use

Fabius Tiro

WARNING

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

Anesthesia workstation
Software 3.n

Typographical conventions

1 Consecutive numbers indicate steps of action, with the numbering restarting with "1" for each new sequence of actions.

- Bullet points indicate individual actions or different options for action.

– Dashes indicate the listing of data, options, or objects.

(A) Letters in parentheses refer to elements in the related illustration.

A Letters in illustrations denote elements referred to in the text.

Any text shown on the screen and any labeling on the device are printed in bold and italics, e.g., ***PEEP*** or ***Man/Spon***.

Use of terms

– The product Fabius Tiro is also referred to as Fabius.

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

Screen layouts and illustrations of the device

The actual screen layout or the device may differ in appearance or in configuration from the illustrations.

Trademarks

Trademark	Trademark owner
Fabius® Tiro	Dräger
DrägerService®	
Spirolog®	
SpiroLife®	
D-Vapor®	
Drägersorb®	
MEDIBUS®	
Vitalink®	
Vapor®	
Selectatec®	Datex-Ohmeda
Korsolex®	BODE Chemie
Neodisher Mediclean®	Dr. Weigert
Gigasept FF®	Schülke & Mayr

Trademark	Trademark owner
Incidin®	Ecolab
Incidur®	

Safety information definitions

WARNING

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

CAUTION

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

NOTE

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

Definition of target groups

For this product, users, service personnel, and experts are defined as target groups.

These target groups must have received instruction in the use of the product and must have the necessary training and knowledge to use, install, reprocess, maintain, or repair the product. The target groups must understand the language of the present document.

The product must be used, installed, reprocessed, maintained, or repaired exclusively by defined target groups.

Users

Users are persons who use the product in accordance with its intended use.

Service personnel

Service personnel are persons who are responsible for the maintenance of the product.

Service personnel must be trained in the maintenance of medical devices and install, reprocess, and maintain the product.

Experts

Experts are persons who perform repair or complex maintenance work on the product.

Experts must have the necessary knowledge and experience with complex maintenance work on the product.

Abbreviations and symbols

Explanations can be found in the sections "Abbreviations" and "Symbols" in chapter "Symbols".

Contents

For your safety and that of your patients

General safety information

The following WARNING and CAUTION statements apply to general operation of the medical device.
WARNING and CAUTION statements specific to its subsystems or particular features appear in the respective sections of these instructions for use or in the instructions for use of any other product being used with this device.

Strictly follow these instructions for use

WARNING

Risk of incorrect operation and incorrect use

Any use of the medical device requires full understanding and strict observation of all sections of these instructions for use. The medical device must only be used for the purpose specified under "Intended use" on page 16 and in conjunction with an appropriate patient monitoring system (see page 10). Strictly observe all WARNING and CAUTION statements throughout these instructions for use and all statements on medical device labels.

Failure to observe these safety information statements constitutes a use of the medical device that is inconsistent with its intended use.

Maintenance

WARNING

Risk of medical device failure and patient injury

The medical device must be inspected and serviced regularly by service personnel. Repair and complex maintenance carried out on the medical device must be performed by experts. If the above is not complied with, medical device failure and patient injury may occur. Observe chapter "Maintenance".

Dräger recommends DrägerService for a service contract and for repairs. Dräger also recommends using original Dräger parts for maintenance.

Safety checks

The medical device must be subject to regular safety checks. See chapter "Maintenance".

Accessories

WARNING

Risk due to incompatible accessories

Dräger has only tested the compatibility of accessories that appear in the current list of accessories or in separate declarations by Dräger. If other, incompatible accessories are used, there is a risk of patient injury due to medical device failure.

Dräger recommends using the medical device only with accessories from the current list of accessories.

WARNING

Risk of operating errors and incorrect use

Strictly observe the instructions for use of all accessory parts, e.g.,:
- **Water traps**
- **Flow sensors**
- **CLIC adapter**
- **CLIC absorber**
- **Soda lime**
- **Breathing hoses**
- **Masks**
- **Filter**
- **Endotracheal suction**
- **Vaporizer**
- **Manual resuscitator**
- **AGSS terminal unit**

Connected devices

WARNING

Risk of electric shock and device malfunction

Any connected devices or device combinations not complying with the requirements in these instructions for use may compromise correct functioning of the medical device.

Before using the medical device, refer to and strictly comply with the instructions for use of all connected devices and device combinations.

WARNING

Risk of device malfunction

This medical device can be operated in combination with other Dräger devices or with devices from other manufacturers. If a device combination is not approved by Dräger, the safety and the functional state 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.**
- **Strictly observe the assembly instructions and instructions for use of each connected device.**

No operation in potentially explosive areas

WARNING

Risk of explosion and fire

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

Safe coupling with electrical equipment

CAUTION

Risk of patient injury

Coupling with electrical equipment that is not mentioned in these instructions for use or assembly instructions may only be done with the respective device manufacturer.

Patient safety

The design of the medical device, the accompanying documentation, and the labeling on the medical device are based on the assumption that the purchase and the use of the medical device are restricted to users, and that certain inherent characteristics of the medical device are known to the user. Instructions and WARNING and CAUTION statements are therefore largely limited to the specifics of the Dräger medical device.

These instructions for use do not contain references to various hazards which are obvious to users who operate this medical device as well as references to the consequences of medical device misuse, and to potentially adverse effects in patients with different underlying diseases. Medical device modification or misuse can be dangerous.

CAUTION

Risk of patient injury

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

Patient monitoring

The user of the medical device is responsible for choosing suitable monitoring that provides appropriate information about medical device performance and the patient's condition.

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

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

Information on electromagnetic compatibility

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

Medical electric equipment is subject to special precautionary measures concerning electromagnetic compatibility (EMC) and must be installed and put into operation in accordance with the EMC information provided (see page 182).

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

WARNING

Risk of electric shock

Do not connect connectors with an ESD warning symbol and do not touch the pins of such connectors without implementing ESD protective measures. Such protective measures may include antistatic clothing and shoes, touching a potential equalization pin before and during connection of the pins, or using electrically insulating and antistatic gloves.

All relevant users must be instructed in these ESD protective measures.

WARNING

Risk of device failure

Electromagnetic fields, e.g., those generated by radio frequency communication equipment such as mobile phones, high-frequency electrical surgery equipment, defibrillators or shortwave therapy devices can disrupt the function of the medical device.

Only operate radio frequency devices at a sufficient safety clearance of at least 20 cm (7.9 in).

WARNING

Risk of electric shock

The connection of devices to auxiliary power sockets can lead to an increased leakage current. If the protective ground of one of these devices fails, the leakage current may rise above the permissible values.

- **Only connect with the approval of the respective device manufacturer.**
- **Have the leakage current checked by service personnel.**
- **If the permissible value is exceeded, use a mains power socket on a wall instead of the auxiliary power socket of the device.**

Installing accessories

CAUTION

Risk of device failure

Install the accessory on the basic device in accordance with the instructions of the basic device.

Check for secure connection to the basic device.

Strictly observe the instructions for use and assembly instructions.

Keeping the instructions for use

CAUTION

Risk of incorrect use

The instructions for use must be kept in an accessible location for users.

Training

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

Product-specific safety information

WARNING

Risk of misinterpretation

Misinterpretation of measured values or other parameters or misdiagnosis can endanger the patient.

Do not make therapeutic decisions based solely on individual measured values and monitoring parameters. Therapeutic decisions must be made solely by the user.

WARNING

Risk of burns

Conductive breathing hoses or face masks can cause burns during HF surgery.

Do not use this type of hose and mask combined with HF surgery.

WARNING

Risk of malfunction

Device failure or user error can compromise the correct therapy functionality of the device. The medical device does not react automatically to certain changes in the patient condition, operating errors, or failure of components.

Continuously monitor the medical device so that corrective measures can be initiated immediately.

WARNING

Risk of device failure

The device can fail if the power supply is interrupted.

Always connect the device on an uninterruptible power supply.

WARNING

Risk of patient injury

Every user has the obligation to assess independently which components are required corresponding to the specific prerequisites for the anesthesia workstation. In accordance with the general safety standards for anesthesia systems, additional monitoring of the concentrations of CO_2 and anesthetic agent is required when operating the device. To guarantee patient safety, however, the following components must always be used:

- **O_2 monitor**
- **Pressure monitor**
- **Volume monitor**

WARNING

Risk of malfunction

Unallowed modifications to the medical device lead to malfunctions.

This medical device may not be changed without permission from Dräger.

WARNING

Risk of accidental movement of the medical device

During operation the medical device can move accidentally.

Activate the castor brakes.

WARNING

Risk of tipping over during transport

The medical device may tip over if handled incorrectly. Observe the following points when transporting medical devices:

- **The medical device may only be moved by people who have the physical ability to do so.**
- **To improve the maneuverability, transport the device with 2 persons.**
- **When transporting over inclines, around corners, or over thresholds (e.g., through doors or in elevators), make sure that the medical device does not bump against anything.**
- **Remove any devices mounted to the holding arms or the top of the device.**
- **Clear the writing tray and fold it down completely or slide it into the device.**
- **Do not pull the medical device over hoses, cables, or other obstacles lying on the floor.**
- **Do not activate the brake while the medical device is being moved.**
- **Always use the handles on the device to push or pull it.**

WARNING

Risk of fire

The flow sensor can ignite medications or other substances that are easily flammable.

- **Do not nebulize medications or other substances that are easily flammable or spray them into the device.**
- **Do not use substances containing alcohol.**
- **Do not allow combustible or explosive substances to enter the breathing system or breathing circuit.**
- **Do not use cyclopropane or ether.**

WARNING

Risk due to failure of flow measurement

Deposits that were not removed during reprocessing can damage the measuring wires in the flow sensor or cause a fire.

- **Before inserting the flow sensor check for visible damage, soiling, and particles. Repeat this check regularly.**
- **Replace flow sensors when damaged, soiled, or not particle-free.**

WARNING

Risk of insufficient ventilation

Device failure or operating errors can lead to ventilation failure.

- **To ensure immediate remedial action in case of device failure, only operate the device under permanent supervision of users.**
- **The general safety standards for anesthesia systems require that a manual resuscitator be kept at the ready for emergency ventilation.**

WARNING

Risk of injury to the lungs

Endotracheal suction can cause negative pressure in the lungs. This pressure can injure the lungs.

Be careful during suction.

WARNING

Risk of not hearing the alarm tone

Dräger recommends that the user remains in the vicinity of the anesthesia workstation. This facilitates fast recognition and response in the event of an alarm.

- **During therapy directly in front of the device.**
- **When preparing for therapy within a distance of up to 4 meters (13 feet).**

WARNING

Risk of crushing

If the writing tray is not correctly locked in place, objects can fall down or fingers and breathing hoses, for example, can be pinched.

Make sure that the writing tray is correctly locked when folding down or sliding into the device.

WARNING

Risk of crushing

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

- **Breathing system cover**
- **Drawers**
- **Extensible writing tray**
- **Swivel arms for mounted devices**
- **Accessories such as gas cylinders, vaporizers, CLIC absorber, and CLIC adapter**

WARNING

Risk of electric shock

This device is only intended for use in rooms in which the power lines correspond to the national applicable safety standards for patient's rooms in hospitals. Observe the following points to avoid electric shock:

- **The covers of the components must not be removed.**
- **Maintenance work must only be performed by DrägerService. Use only grounded electrical connections and power cables that meet hospital standards.**
- **Before connecting the medical device, make sure that external devices are grounded to meet the hospital standard (in accordance with national applicable regulations).**
- **Before cleaning work or maintenance work is performed, disconnect all plugs for the power supply.**
- **If the medical device has come in contact with liquids, let it dry completely before it is reconnected to the power supply.**
- **Check that the power cable is securely clamped to the power inlet.**
- **Only connect additional devices if they have been approved by Dräger.**

WARNING

Risk of device failures

If the anesthesia workstation is used in a tipped position, parts can be damaged or their function can be comprised.

Do not use the anesthesia workstation at an inclination angle over 5°.

NOTE

The device software of Fabius must be installed by experts. Dräger recommends having the software installation performed by DrägerService.

Application

Intended use

The Fabius anesthesia workstation for inhalational anesthesia is appropriate for use in operating rooms, induction rooms, and recovery rooms.

Fabius is equipped with an electrically driven and electronically controlled ventilator. The following parameters are monitored:

– Airway pressure (***PAW***),
– Tidal volume (***VT***)
– Inspiratory oxygen concentration (FiO_2)

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. A Dräger anesthetic vaporizer is used to enrich the fresh gas with volatile anesthetic agents. The gas supply is done via a central gas supply system or via externally connected gas cylinders.

Fabius is equipped with a compact breathing system that offers fresh gas decoupling, PEEP, and pressure limitation.

The following ventilation modes are available:

– ***Volume Control*** (volume-controlled ventilation)
– ***Pressure Control**** (pressure-controlled ventilation)
– ***Pressure Support**** (pressure-supported ventilation)
– ***SIMV/PS**** (synchronized intermittent ventilation with pressure support)
– ***ManSpont*** (manual ventilation/spontaneous breathing)

WARNING

Risk of patient injury

In accordance with the general safety standards for anesthesia systems, additional monitoring of the concentrations of CO_2 and anesthetic agent is required.

WARNING

Risk of insufficient ventilation

Device failure or operating errors can lead to ventilation failure.
– To ensure immediate remedial action in case of device failure, only operate the device under permanent supervision of users.
– The general safety standards for anesthesia systems require that a manual resuscitator be kept at the ready for emergency ventilation.

WARNING

Risk due to malignant hyperthermia

Volatile anesthetic agents may cause malignant hyperthermia.

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

WARNING

Risk due to the accumulation of acetone in the patient

Do not perform low-flow anesthesia on patients with ketoacidosis or patients under the influence of alcohol. The risk of accumulation of acetone in the patient increases in such cases.

* optional

NOTE

CO_2 values and anesthetic gas values can be monitored if the Fabius is combined with a gas monitor (e.g., Vamos) or a gas analyzer (e.g., Scio with Dräger patient monitor).

NOTE

O_2 monitoring can be deactivated on site by an authorized service partner. More information can be found in chapter "Deactivating the O_2 monitoring" on page 119. If O_2 monitoring is deactivated, use external O_2 monitoring.

Indications/Contraindications

Indications

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

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.

Patient status must be continuously monitored for potential changes.

NOTE

Fabius applies medical gases such as O_2, N_2O, or volatile anesthetic agents. For contraindications to the applied medical gases, strictly observe the instructions for use of the medical gas.

Further information on application

Environment of use

Fabius is designed for use in rooms in which therapeutic or diagnostic interventions can be carried out.

WARNING

Risk of explosion

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

WARNING

Risk of device malfunctions and/or patient injury and user injury

Magnetic fields can negatively influence the correct functioning of the medical device and therefore endanger the patient or user.

Do not use the medical device near magnetic resonance imagers.

WARNING

Do not use soda lime based on potassium hydroxide. Otherwise, there is a risk of CO formation.

Do not use Fabius in the following environments:

– Outside of massive buildings
– In intensive care units
– During patient transport
– In vehicles, airplanes, or helicopters

The MEDIBUS and Vitalink protocols

MEDIBUS and Vitalink are software protocols for the transfer of data between Fabius and an external medical or non-medical product (e.g., hemodynamic monitors, data management systems, or Windows-based computers) via an RS232 interface (see instructions for use 9038530, 3rd edition or higher).

WARNING

Risk of patient injury

All data transferred via the MEDIBUS interface are for information only and must not be used as the sole basis for diagnostic or therapeutic decisions. The data accessible via this interface are not intended for use with a distributed alarm system in accordance with IEC 60601-1-8:2012 (in the sense of remote monitoring).

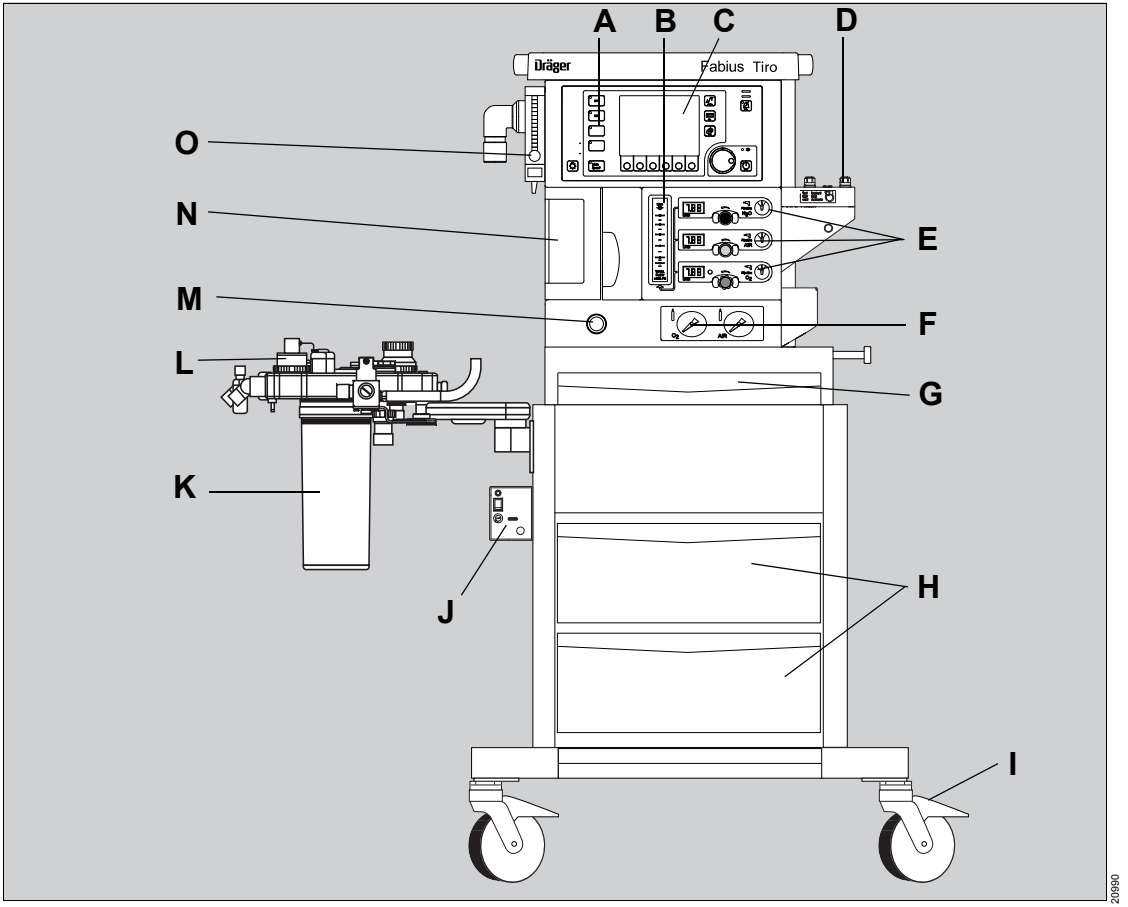
WARNING

For the protection of patients and users from electrical risk, it is required that all systems that consist of medical devices and other electrical devices, such as computers, printers, etc., are assembled exclusively by trained personnel.

The system must meet the requirements of standards IEC 60601-1-1 and IEC 60601-1-2, or of IEC 60601-1:2005 for medical electrical equipment.

Overview

Fabius Tiro as trolley version (front view)



A Ventilator control panel (settings for ventilation parameters and airway monitoring)

B Total flow tube

C Screen

D Vaporizer mount

E Fresh-gas delivery

F Pressure gauge for gas cylinders (O_2, Air, or N_2O)*

G Writing tray

H Drawers

I Locking brake

J Power supply unit for COSY breathing system heating*

K CO_2 absorber

L Compact breathing system (COSY)

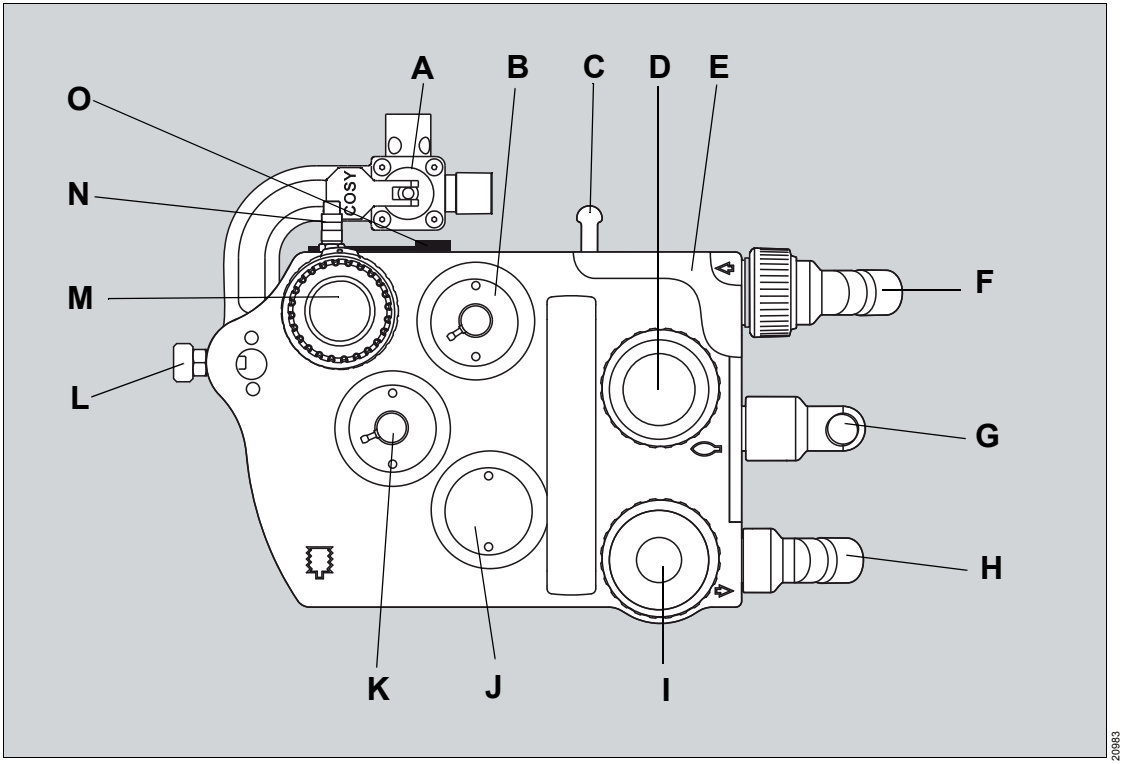
M O_2 flush

N Ventilator

O Supplemental O_2 delivery for O_2 insufflation*

* optional

Compact breathing system COSY (top view)



A External fresh-gas outlet*

B Connection for PEEP/PMAX valve

C Breathing bag holder

D Expiratory valve

E Flow-sensor guard or COSY guard (not illustrated)

F Expiratory port

G Connection for breathing bag

H Inspiratory port

I Inspiratory valve

J Fresh gas decoupling valve

K Connection for APL bypass valve

L Mount with locking pin

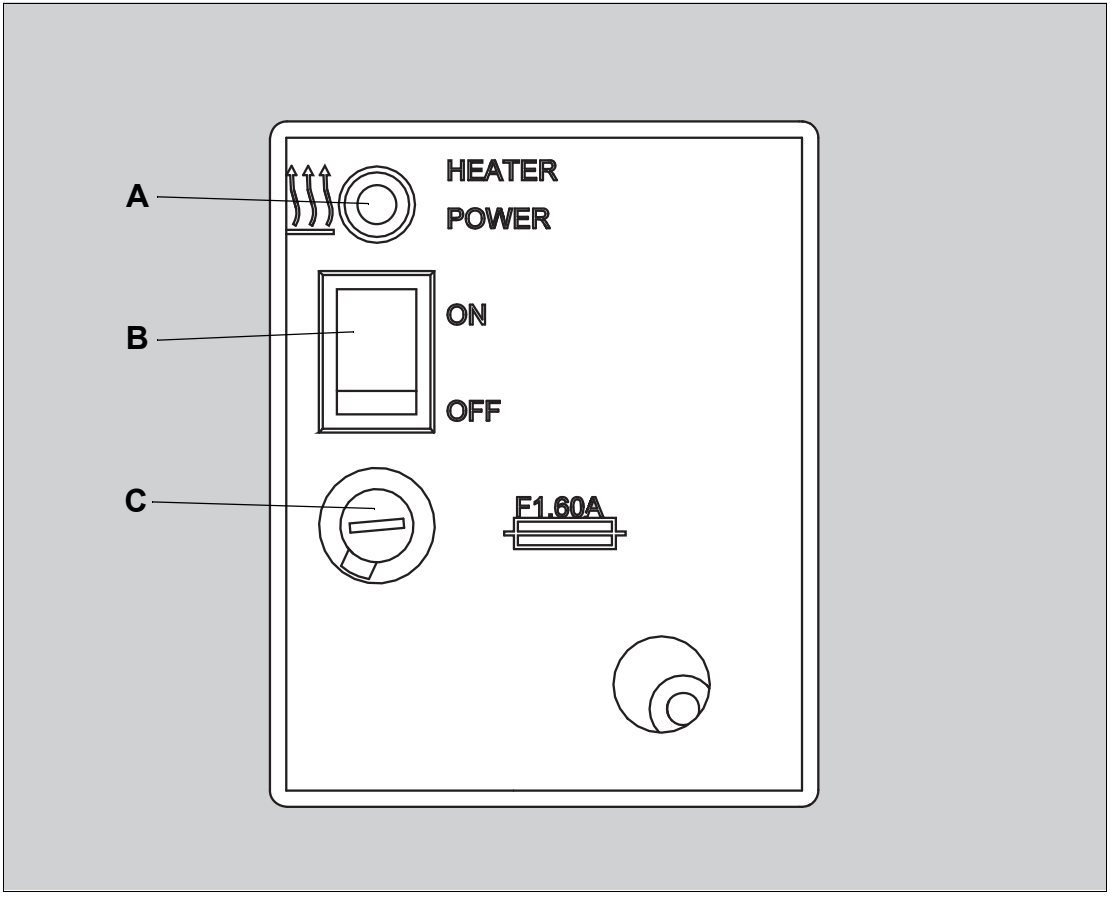
M APL valve with selection for manual ventilation (***Man***) and spontaneous breathing (***Spont***)

N Connection for sample line

O Holder for sample line (optional)

* optional

Power supply unit for COSY heating (front view)

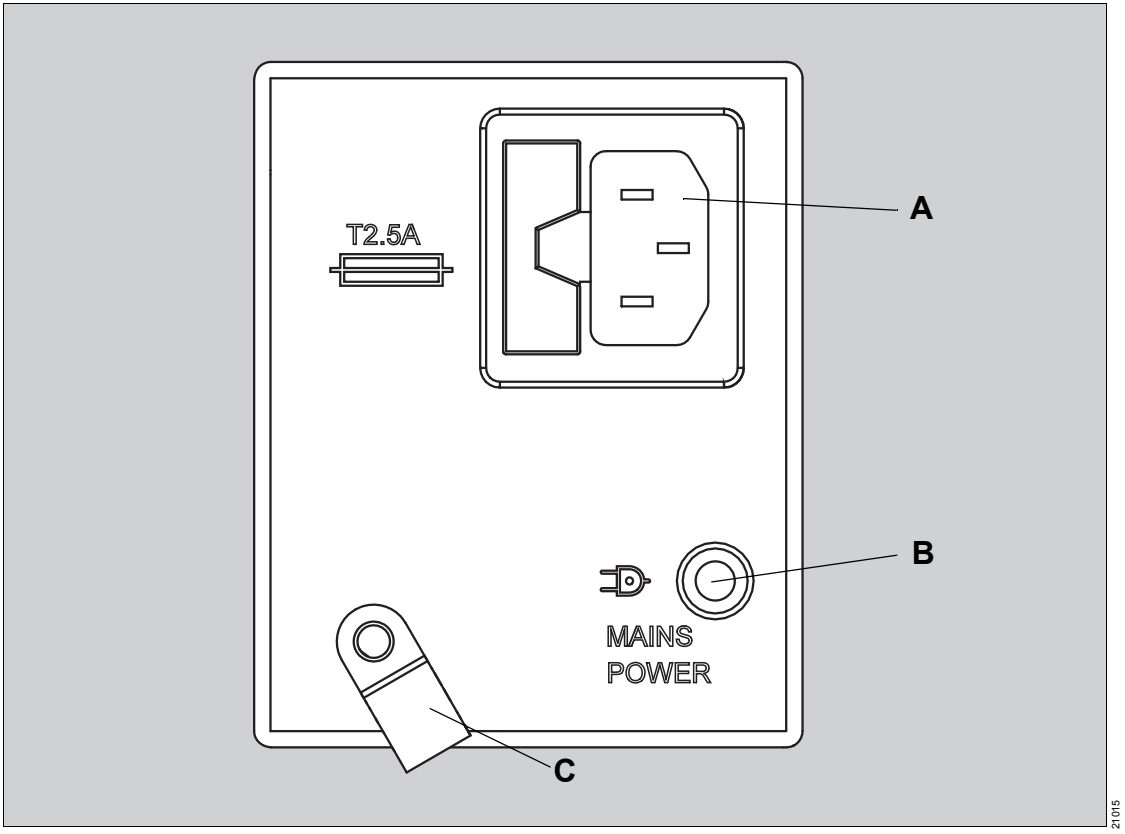


A LED indicator for COSY heating

B On/Off switch

C Fuse

Power supply unit for COSY heating (rear view)

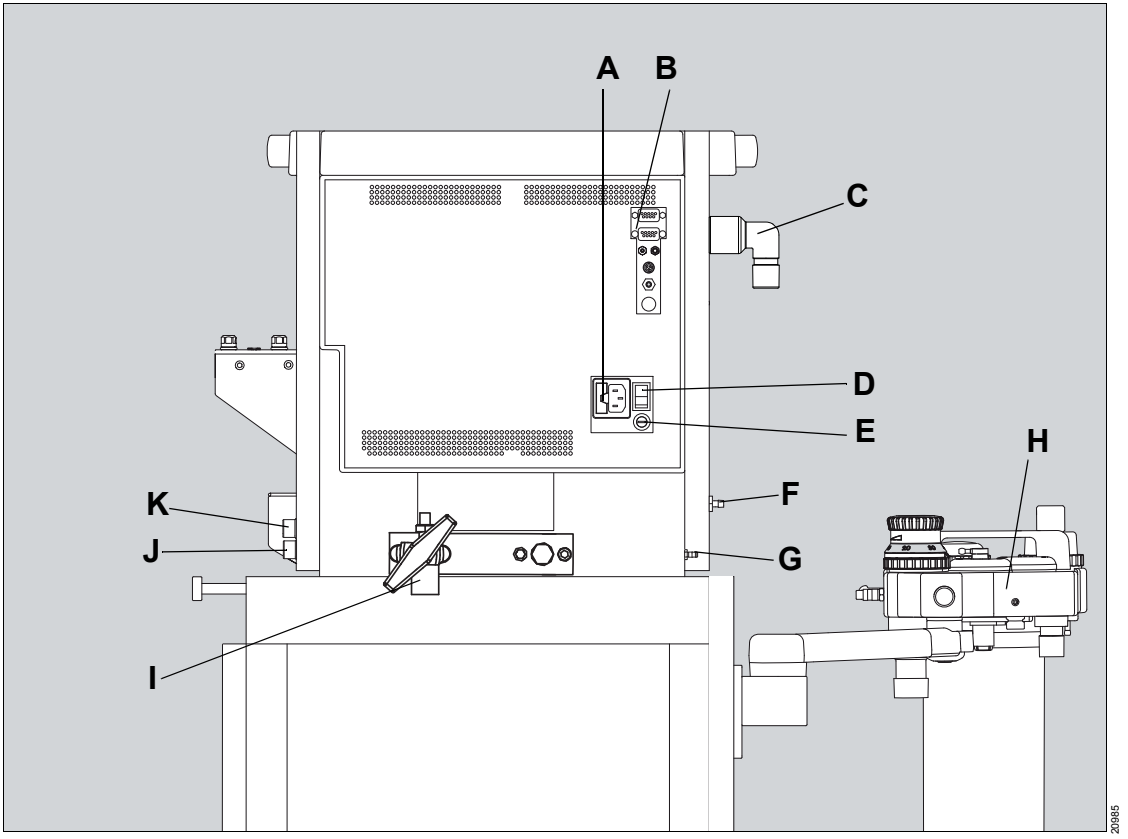


A Power inlet

B LED indicator for power supply

C Cable clamp

Rear view (pin-index connection)



A Power inlet

B Interface panel

C Connection for ventilator hose

D On/Off switch

E Fuse

F Fresh-gas outlet

G Potential equalization pin

H Compact breathing system (COSY)

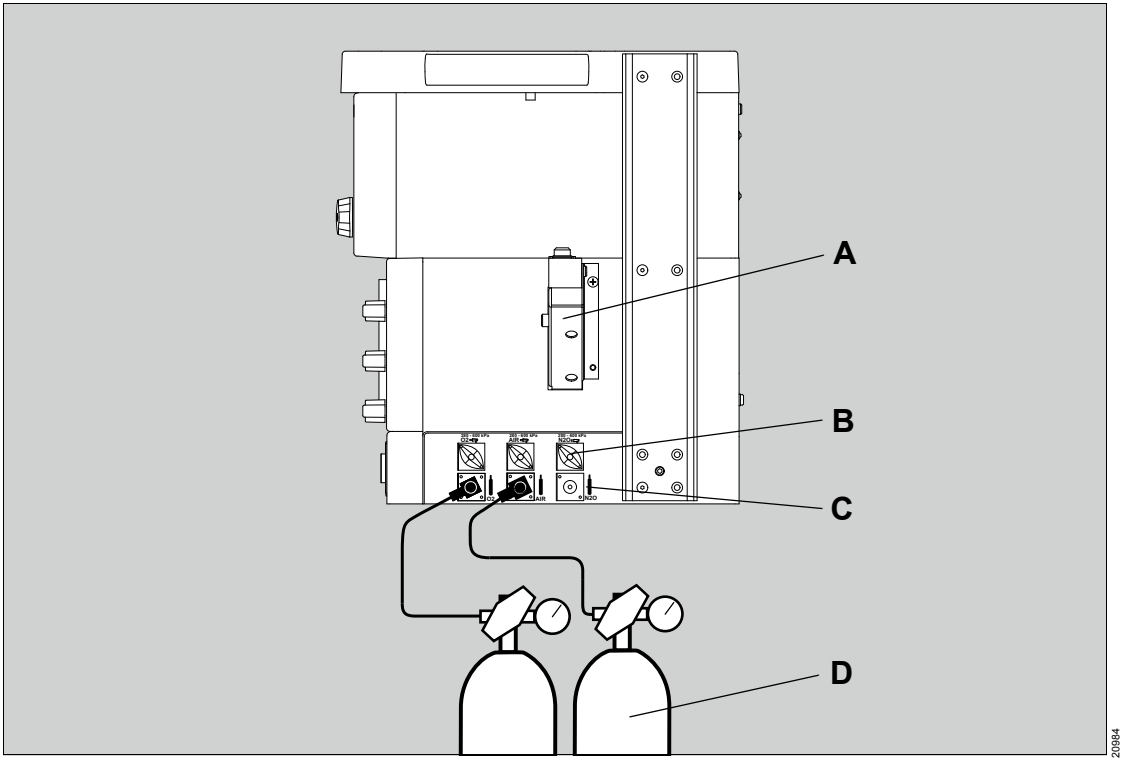
I Pin-index connection*

J Connection for compressed gas hoses of the gas cylinders

K 2 open connections for central supply hoses, 1 sealed connection without function

* optional

Gas connections (side view)



A Vaporizer mount

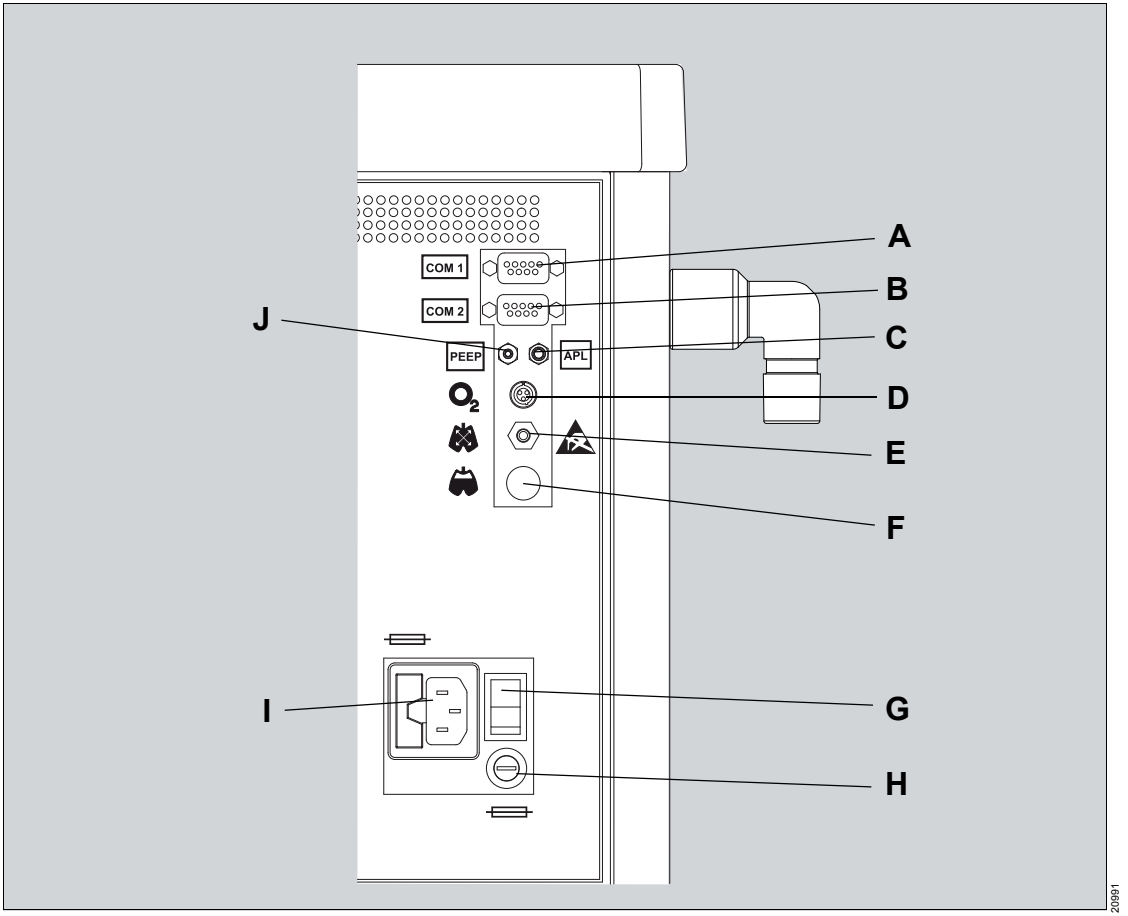
B Connections for central supply hoses

C Connections for gas cylinders with O_2, O_2 and N_2O, or O_2 and Air (screw connections)*

D Gas cylinders

* optional

Interface panel



A COM 1 port

B COM 2 port*

C Connection for APL hose

D Socket for O_2 sensor

E Socket for airway pressure sensor

F Socket for flow sensor

G On/Off switch

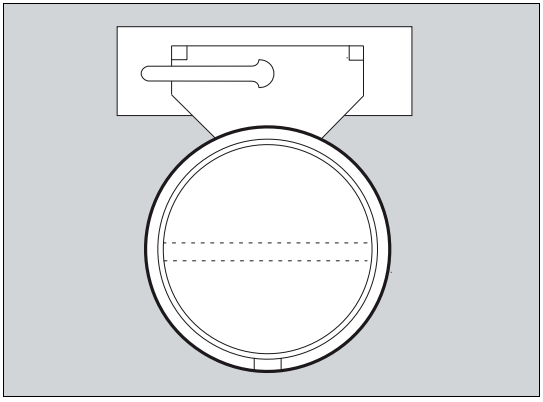
H Fuse

I Power inlet

J Connection for PEEP hose

* optional

Vaporizer



Vaporizers are used to enrich fresh gas with a precise delivered concentration of a volatile anesthetic agent.

Vaporizer	Anesthetic agent
Vapor 2000/3000	Isoflurane
	Halothane
	Enflurane
	Sevoflurane
D-Vapor/ D-Vapor 3000	Desflurane

Vapor 2000/3000 is an unheated, calibrated vaporizer for enriching dry, medical fresh gas of an anesthesia workstation with a precise delivered concentration of a volatile anesthetic agent.

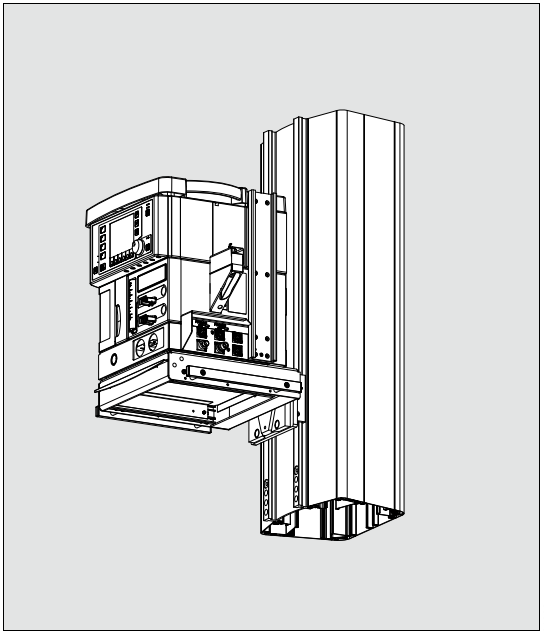
D-Vapor/D-Vapor 3000 is a heated, calibrated vaporizer for enriching dry, medical fresh gas of an anesthesia workstation with the anesthetic agent desflurane.

There are various connector systems with which vaporizes can be connected to an anesthesia workstation.

Dräger recommends using only vaporizers that are listed in the list of accessories.

More information can be found in the respective instructions for use of the anesthetic vaporizers used.

Ceiling-mounted version (optional)



Fabius can be used in combination with the ceiling supply units Movita/Movita lift or Forta lift as a ceiling-mounted version. In this case, the anesthesia workstation is not placed on a trolley, (see chapter "Fabius Tiro as trolley version (front view)" on page 20), but rather on the mount of a ceiling supply unit.

Observe the corresponding assembly instructions (9037202).

CAUTION

Risk of tipping over

If the device is dismounted from the ceiling supply unit and set on the floor, it can tip over. Observe the following steps before setting the device on the floor:
– Remove all additionally mounted components.
– Fold the holding arms in on the Fabius.
– Make sure there is sufficient free space.

CAUTION

Risk of crushing

When the medical device is set on the floor, body parts can be crushed.

Make sure there is sufficient free space.

CAUTION

Risk of injury or risk of damage to the medical device

If the medical device is let down to the floor, obstructions can damage the medical device. If the medical device is lifted or lowered, protruding parts can be damaged.
– Remove all obstructions from under the device.
– Watch out for protruding parts.

CAUTION

Risk of device failure

If the medical device is used in a tipped position, parts can be damaged or their function can be comprised.

Do not use the anesthesia workstation at an inclination angle over 5°.

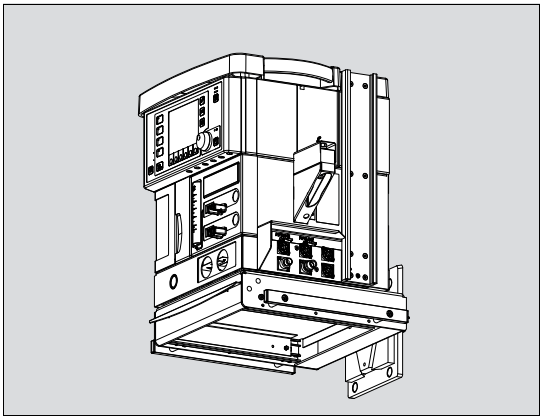
CAUTION

Risk of injury or risk of damage to the medical device

If the maximum weight is exceeded, the holder can release from the ceiling supply unit.

The total weight of the anesthesia workstation including all accessories must not be exceeded, see "Instructions for mounting the accessories" and "Technical data".

Wall-mounted version (optional)



Fabius can also be mounted on the wall. In this case, the anesthesia workstation is not placed on a trolley, (see chapter "Fabius Tiro as trolley version (front view)" on page 20), but rather on a mount on the wall.

Observe the corresponding assembly instructions (9037202).

CAUTION

Risk of tipping over

If the device is removed from the mount and set on the floor, it can tip over. Observe the following steps before setting the device on the floor:
– All additionally mounted components must be removed beforehand.
– Fold the holding arms in on the Fabius.
– Make sure there is sufficient free space.

CAUTION

Risk of injury or risk of damage to the medical device

If the maximum weight is exceeded, the holder can release from the wall mount.

The total weight of the anesthesia workstation including all accessories must not be exceeded, see "Instructions for mounting the accessories" and "Technical data".

CAUTION

Risk of injury or risk of damage to the medical device

When the device is being mounted to the wall, pivoted in its holder, or removed from the wall, the cables and hoses may be damaged and personal damage may occur.
– Ensure that cables and hoses are not pinched, kinked, or torn.
– When mounting, removing, or pivoting the device, ensure that body parts are not crushed.
– The device may only be moved by people who have the physical ability to do so. Dräger recommends that such tasks be carried out by two people.

Supplemental O_2 delivery (optional)

WARNING

Risk due to overpressure

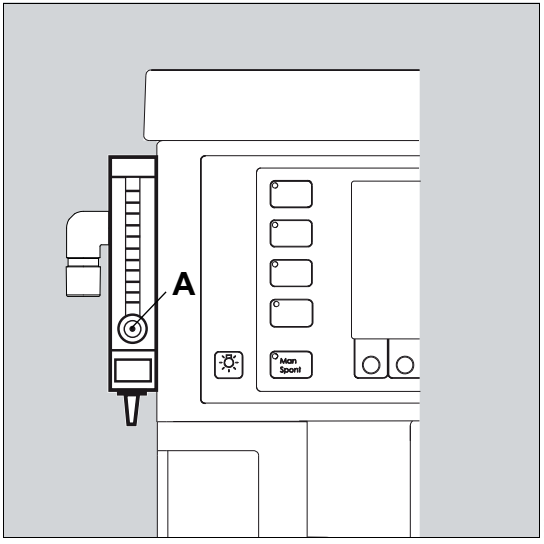
When the patient's connection to the supplemental O_2 delivery is made using a breathing circuit without relief valve, increased pressure may be applied to the patient.

When connecting the patient, only use a breathing circuit with relief valve or do not connect pressure-tight.

WARNING

Risk of fire

The oxygen can ignite when cauterizing near an oxygen source.
- **Make sure that all connections (e.g., Y-piece, breathing hoses) do not leak.**
- **Before cauterizing, close the flow control valve.**
- **Remove mask.**
- **Wait a few moments.**



The supplemental O_2 delivery supplies pure oxygen with an exact metered flow, e.g., for O_2 insufflation using a face mask during a regional anesthesia. The supplemental O_2 delivery is not only possible in standby mode and during operation, but also if Fabius is switched off.

The supplemental O_2 delivery can supply additional inspiratory oxygen for the patient for the following types of anesthesia:

– Spinal anesthesia
– Epidural anesthesia
– Other regional anesthesia

To increase the O_2 concentration in the breathing gas, the supplemental O_2 delivery can be used in combination with a breathing bag* .

Functional check of the supplemental O_2 delivery

– Turn the flow control valve (A) counterclockwise.
– Check if the float can freely move in the flow tube.

After the O_2 insufflation is ended, the flow control valve of the supplementary O_2 delivery must be completely closed:

- Turn the flow control valve (A) clockwise to the final position stop.

* ASTM F1850-22(2005) §76

APL valve

WARNING

Risk of patient injury

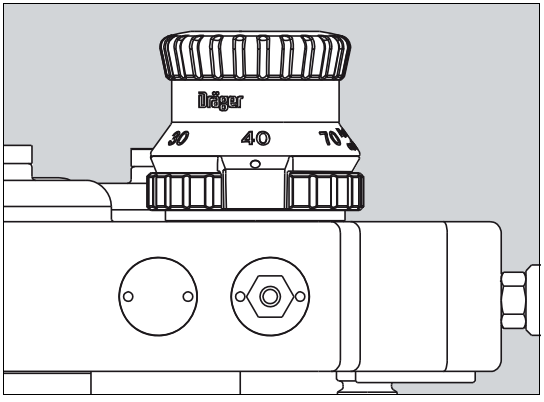
Wires and cables can get caught under the APL valve adjustment knob and block the APL valve.

Lay all cables and wires, e.g., sample line so that they do not get caught.

The APL valve has 2 functions:

– During manual ventilation, the maximum airway pressure is limited.
– During manual ventilation and spontaneous breathing, excess gas is discharged into the anesthetic gas scavenging system.

The functional state is only guaranteed if the ventilator is in ***ManSpont*** mode or is bypassed.



Different settings can be made on the APL valve adjustment knob:

– Change between manual ventilation (***Man***) and spontaneous breathing (***Spont***)
– Setting of the maximum airway pressure for manual ventilation

NOTE

The APL valve is automatically separated from the breathing system as soon as an automatic ventilation mode is selected.

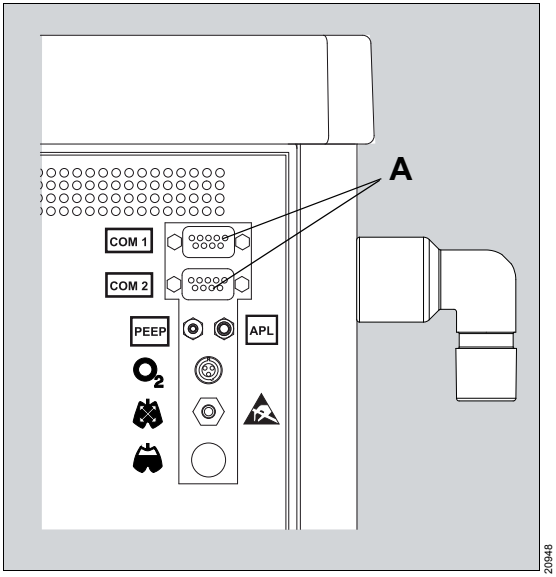
WARNING

Risk of excessively high airway pressures

If the ventilator fails, the device switches into the *ManSpont* ventilation mode.

The APL valve should also be set to a pressure limitation value suitable for the patient when using automatic ventilation modes. If the ventilator fails, ventilate the patient manually.

Interfaces



A There are 2 ports on the rear of Fabius for communication with external devices. The ports are marked with COM 1 and COM 2* . These ports are used for data communication using the Dräger MEDIBUS or Vitalink data protocols.

WARNING

Risk of electric shock

Connecting devices to the MEDIBUS interfaces can lead to an increased leakage current. If the protective ground of one of these devices fails, the leakage current may rise above the permissible values.

- **Only connect with the approval of the respective device manufacturer.**
- **Have the leakage current checked by service personnel.**
- **If the permissible value is exceeded, disconnect the devices from the MEDIBUS interface.**

CAUTION

Risk of electrical safety

To ensure electrical safety, only connect devices to the serial ports (COM 1 and COM 2) with a maximum nominal voltage of 24 Vdc that meet one of the following standards:

- IEC 60950-1: ungrounded SELV circuits
- IEC 60601-1 (as of 2nd edition): exposed secondary circuits

CAUTION

Risk of device failure

Only use monitors, mounting parts, and connection cables that have been approved by Dräger.

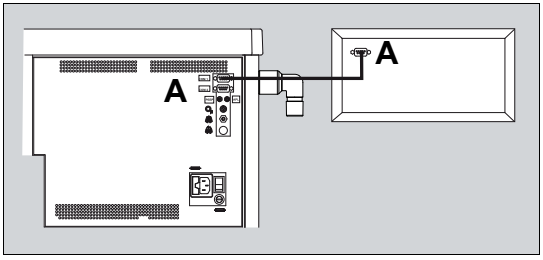
NOTE

The data transmission of the gas analysis data must be activated by DrägerService or the authorized local service partner.

* optional

Recommended device configuration

Configuration 1

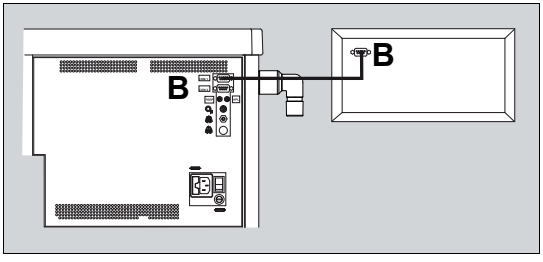


– Fabius

– Breathing gas monitor (Vamos)

1 Connect the breathing gas monitor either to COM 1 or COM 2* (A).

Configuration 2

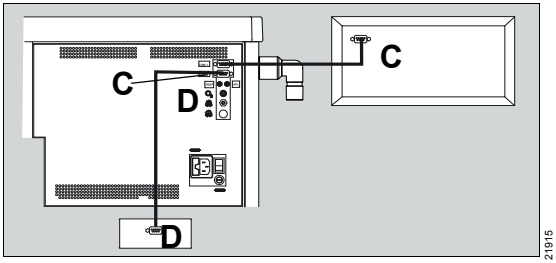


– Fabius

– Multiparameter monitor with a COM connection

1 Connect monitor to COM 1 (B).

Configuration 3



– Fabius

– Gas analyzer (SCIO/Vamos)

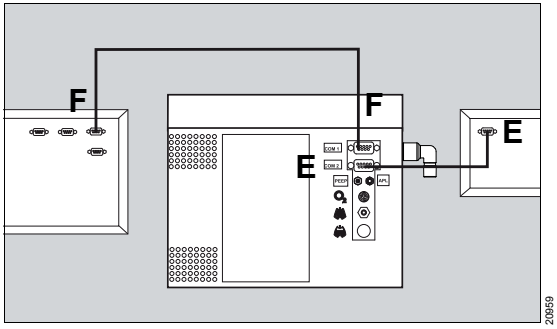
– Multiparameter monitor with a COM connection

1 Connect monitor to COM 1 (C).

2 Connect the gas analyzer to connection COM 2* (D).

* optional

Configuration 4



NOTE

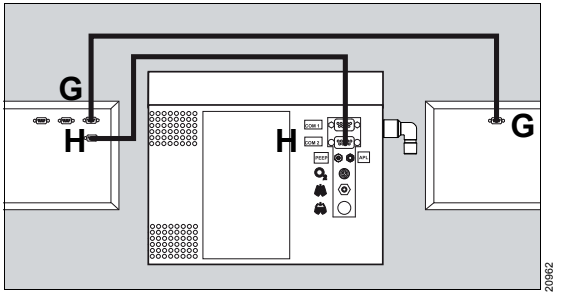
The data transmission of the gas analysis data must be activated by DrägerService or the authorized local service partner.

– Fabius
– Breathing gas monitor (Vamos)
– Automatic anesthesia protocol system

1 Connect the breathing gas monitor to COM 2(E).

2 Connect the anesthesia protocol system to COM 1 (F).

Configuration 5

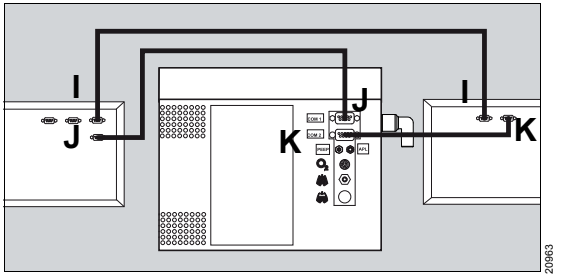


– Fabius
– Multiparameter monitor with a COM interface
– Automatic anesthesia protocol system

1 Connect monitor (G) to the anesthesia protocol system.

2 Connect the anesthesia protocol system to COM 1 (H) or COM 2* .

Configuration 6



– Fabius
– Multiparameter monitor with 2 COM interfaces
– Automatic anesthesia protocol system

1 Connect monitor (I) to the anesthesia protocol system.

2 Connect the anesthesia protocol system to COM 1 (J).

3 Connect monitor to COM 2 (K).

* optional

External fresh-gas outlet

The external fresh-gas outlet is used for connecting different non-rebreathing systems, e.g., Magill, Kuhn, Waters, Bain.

WARNING

Risk of excessive airway pressure

Without a pressure-relief valve or breathing bag, airway pressure may become too high.

Only connect non-rebreathing systems with breathing bag or pressure-relief valves that comply with applicable safety standards.

WARNING

Insufficient gas supply to the patient

Non-rebreathing systems are only intended for manual ventilation or spontaneous breathing and must only be connected to the external fresh-gas outlet.

When using a non-rebreathing system, ensure an adequate gas monitoring.

WARNING

Risk of misinterpretation of measured values

The values for O_2, pressure, and volume displayed on Fabius do not correspond to the values for the patient connected to external fresh-gas outlet as they are based on measurements taken at the compact breathing system.

When using the external fresh-gas outlet, change into the *Standby* mode.

WARNING

Risk of faulty gas delivery

O_2 and CO_2 and any anesthetic gases must also be monitored for non-rebreathing systems.

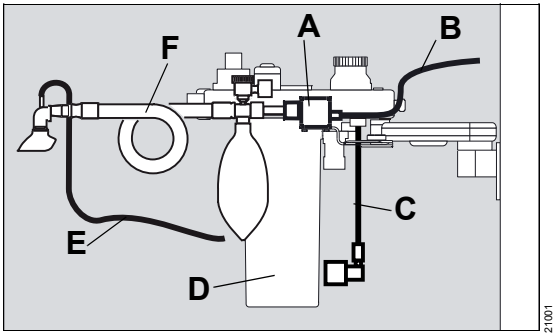
The sample line must be connected with the connector of the non-rebreathing system and the connector of the gas analyzer (e.g., Scio, Vamos).

NOTE

Strictly observe the instructions for use of the non-rebreathing system (e.g., Magill, Waters, Bain).

Using the external fresh-gas outlet as a common gas outlet

Overview



A External fresh-gas outlet

B Long fresh-gas hose (on Fabius)

C Short fresh-gas hose (on compact breathing system)

D Compact breathing system

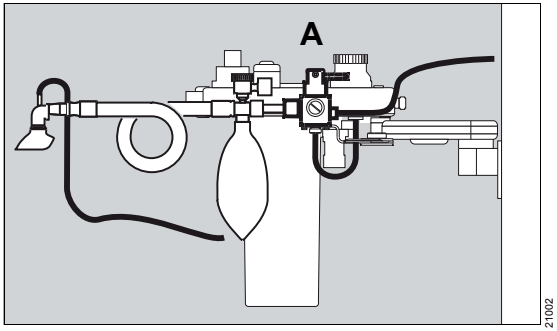
E Sample line

F Non-rebreathing system (e.g., Bain)

Use of the external fresh-gas outlet with an additional switch*

The switch enables the simple switching of the fresh-gas supply from the compact breathing system to the non-rebreathing system.

Overview



A External fresh-gas outlet with an additional switch

B Long fresh-gas hose (on Fabius)

C Short fresh-gas hose (on compact breathing system)

D Compact breathing system

E Sample line

F Non-rebreathing system (e.g., Bain)

* optional

Abbreviations

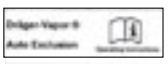
Abbreviation	Explanation
%, Vol %	Percentage gas ratio, related to total volume
A	Ampere
AGS	Anesthetic gas receiving system
AGSS	Anesthetic gas scavenging system
Air	Medical compressed air
APL	Adjustable Pressure Limitation, adjustable pressure limitation
bpm	Breaths per minute
BTPS	Body Temperature and Pressure, Saturated 37 °C (98.6 °F), ambient pressure, 100 % relative humidity
CAL	Display when a measurement value is calibrated.
cmH_2O	Centimeters of water
CO	Carbon monoxide
CO_2	Carbon dioxide
COM	Serial interface
COSY	Compact breathing system
CSA	Canadian Standards Agency
dB(A)	Decibel, rated sound level unit
EMC	Electromagnetic compatibility
ESD	Electrostatic Discharge, electrostatic discharge
FiO_2	Inspiratory oxygen fraction
Freq	Respiratory rate
Freq Min	Mandatory minimal respiratory rate in ***Pressure Support*** mode
HF	High-frequency
hPa	Hectopascal
Insp Flow	Inspiratory flow

Abbreviation	Explanation
kPa	Kilopascal
L/min	Liters per minute
lbs	Pound; unit of mass
LED	Light emitting diode
ManSpont	Manual ventilation/Spontaneous breathing
mbar	Millibar
MEAN	Mean airway pressure
MEDIBUS.X	Dräger communications protocol for medical devices with uniform data definition for all devices
min	Minute
mL	Milliliter
mmHg	Millimeter of mercury
MRI	Magnetic resonance imaging
MV	Minute volume
N_2O	Nitrous oxide, dinitrogen monoxide
NMI	Nuclear magnetic imaging
NMR	Magnetic resonance
O_2	Oxygen
O_2+	O_2 flush
PAW	Airway pressure
PEAK	Peak airway pressure
PEEP	Positive end-expiratory pressure
PINSP	Inspiratory pressure
PLAT	Plateau pressure
PMAX	Pressure limitation
psi	pounds per square inch
SIMV	Synchronized Intermittent Mandatory Ventilation

Abbreviation	Explanation
S-ORC	Sensitive Oxygen Ratio Controller, maintains a minimum O_2 concentration
STAPD	Standard Temperature, Ambient Pressure, Dry 20 °C (68 °F), ambient pressure, dry gas
T_I, ***TINSP***	Inspiratory time
T_E	Expiratory time
TI:TE	Ratio of inspiratory time to expiratory time
TIP:TI	Ratio of inspiratory pause to inspiratory time
Trigger	Trigger
UMDNS	Universal Medical Device Nomenclature System, nomenclature for medical devices
USB	Universal Serial Bus, computer interface
VT	Tidal volume
ΔPPS	Differential pressure of the pressure support in ***Pressure Support*** mode

Symbols

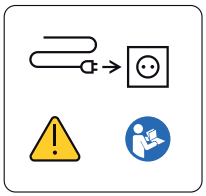
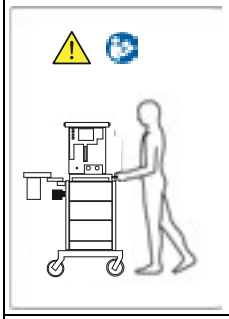
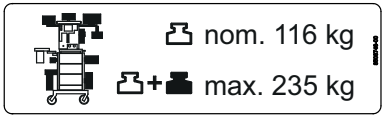
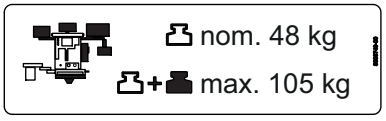
Symbol	Explanation
	Manufacturer
	Date of manufacture
	Use by
	WEEE label, Directive 2002/96/EC
	Consult instructions for use
	Warning! Strictly follow these instructions for use
	Caution! Observe the accompanying documentation!(symbol)
	Attention! (safety sign)
	Caution! Risk of electric shock. Do not remove cover.
	Applied part, protection class BF (Body Floating)
	Applied part of protection class B
	ESD warning label, observe the warning statement, see "Information on electromagnetic compatibility" on page 10
	Risk of crushing
	Label on device surfaces where the risk of tipping is increased by e.g., leaning on or against the surface or pushing
SN	Serial number
REF	Order number

Symbol	Explanation
LOT	Batch designation
	Keep away from sunlight
	Storage temperature
	Relative humidity
	Atmospheric pressure
	Do not use if package damaged
	Do not reuse
	Alarm inactive
	The alarm tone is suppressed for 2 minutes.
	Mains power
	Partial power supply switched on
	Total power supply switched on
	Connection for potential equalization
	Auto Exclusion Plug-in connection
	Gas cylinder connection
	CO_2 absorber bypass
	Read the flow at the center of the float.
	Non-rebreathing system

Symbol	Explanation
	Vaporizer plug-in system, "fixed" position
	O_2 flush
	Connection to central gas supply
	Breathing bag
	Power supply of the breathing system heating
	Battery charge
	Caution when touching hot surfaces.
	Upper and lower alarm limits
	Lower alarm limit
	Upper alarm limit
	Socket for O_2 sensor
	Socket for flow sensor
	Socket for airway pressure sensor
	Ventilator connection
	Fuse
	Do not oil!
	Close menu
	Key for access to alarm limits
	Key to call up main screen

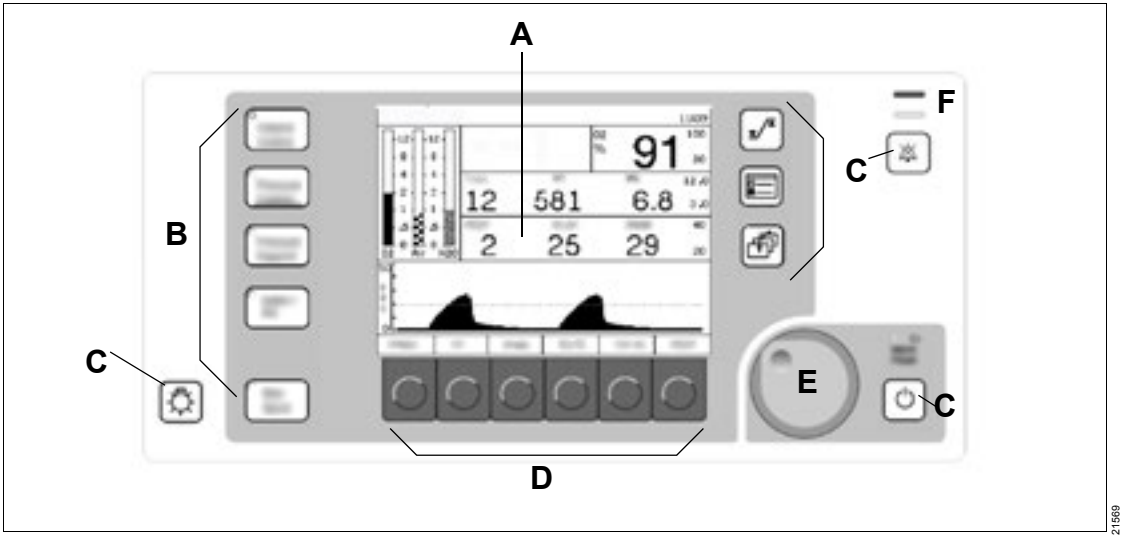
Symbol	Explanation
	Key for switching the workstation light on and off
	Key to call up the configuration menu
	Key for suppressing the acoustic alarm signal for 2 minutes
	Standby key

Product labels

Product label	Explanation
	When connecting auxiliary devices, be aware of the leakage current.
	Transport instructions, see "Preparing for storage or transport" on page 111
	Trolley version: Observe the weight of the nominal configuration and the permissible total weight, see "Technical data".
	Wall-mounted version, ceiling-mounted version: Observe the weight of the nominal configuration and the permissible total weight, see "Technical data".

Operating concept

Control panel



The control panel contains the following main elements:

A Screen

B Key to select ventilation modes

- ***Volume Control***
- ***Pressure Control***
- ***Pressure Support****
- ***SIMV/PS****
- ***ManSpont***

C Key for more functions

Key	Function
	Switches the workstation light and ventilator illumination on and off.
	Opens the window with alarm limits.

Key	Function
	● In the mode ***Standby***: Opens a menu for configuration of the system settings and default settings, see chapter "Configuration in standby mode" on page 125 ● In a ventilation mode: Opens a menu for displaying and changing the monitoring settings, see chapter "Configuration during operation" on page 139
	Changes from displayed screen to the main screen.
	The alarm tone of all active alarms is suppressed for 2 minutes.
	Switches to ***Standby*** mode. Monitoring is switched off and the ventilator stops.

* optional

D Keys with variable functions (called "softkeys" in this document)

E Rotary knob to select and confirm screen settings

F LED indicators

Softkeys

The labeling on the softkeys depends on the active ventilation mode.

In all ventilation modes, the softkeys only display those ventilation parameters and ventilation functions that are available in the respective ventilation mode.

Example for ***Volume Control*** mode:

– ***PMAX***

– ***VT***

– ***Freq***

– ***TI:TE***

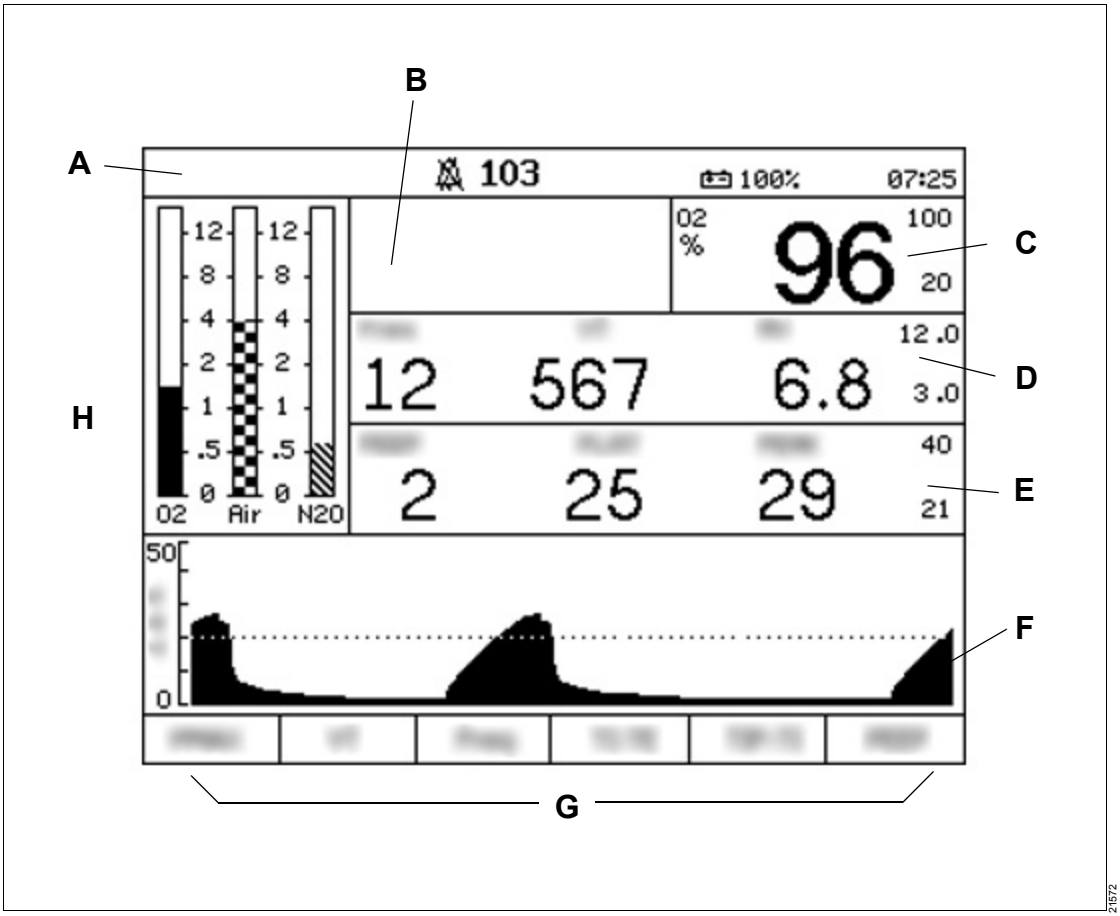
– ***TIP:TI***

– ***PEEP***

More information can be found in chapter "Configuration in standby mode" on page 125.

Screen display

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



A Status bar

The following information is displayed in the status bar:

- Current ventilation mode
- Remaining time of alarm tone suppression
- Status of the desflurane compensation
- Remaining battery charge
- Current time

B Alarm message field

Display of maximum 4 alarm messages* with highest priority

C O_2 monitoring

Display of the inspiratory oxygen concentration in percent (%) as well as the upper and lower alarm limits

* for Japan and China maximum 3 alarm messages

D Volume monitoring

Display of:

- Respiratory rate of the patient in breaths per minute (***Freq***)
- Tidal volume (***VT***)
- Minute volume (***MV***)
- Upper and lower alarm limits of the minute volume

E Airway pressure monitoring

Display of:

- Positive end-expiratory pressure (***PEEP***)
- Mean airway pressure (***MEAN***)
- Plateau pressure (***PLAT***)
- Peak pressure (***PEAK***)

F Pressure waveform for airway pressure

G Softkeys (labeling depending on ventilation mode)

H Virtual flow tubes for O_2, Air, N_2O

Selecting and setting

Monitoring settings and system settings

Each of these settings requires a selection and confirmation by pressing the rotary knob.

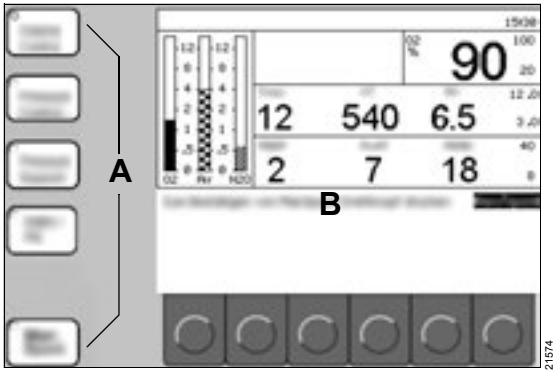
- To change a value or parameter or to navigate in the menus, turn the rotary knob.

In this document, these procedural steps are simply called "select."

- To confirm a value or a selection, press the rotary knob.

Without confirmation with the rotary knob the value or parameter is not changed. In this document, these procedural steps are simply called "confirm."

Changing the ventilation mode



1 Select a ventilation mode (A).

- The LED in the key flashes.
- The pressure waveform is replaced by a dialog window with ventilation settings.
- A message with further instructions (B) is displayed.

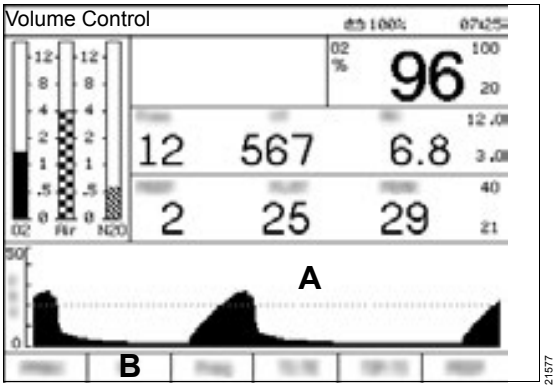
2 Confirm the ventilation mode.

- The LED in the key is continuously lit up.
- The pressure waveform is displayed again.

Selecting and setting the ventilation parameters

Example: Changing the parameter ***VT*** in ***Volume Control*** mode

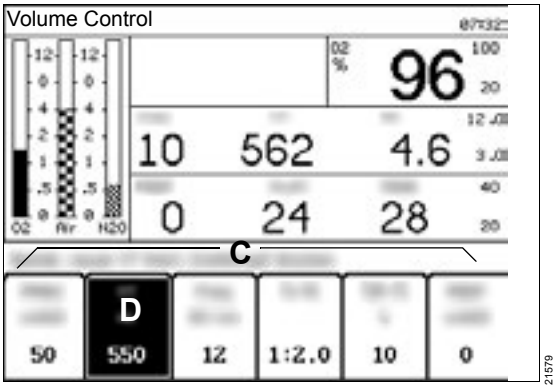
Prerequisite: Fabius is in ***Volume Control*** mode



1 Press the ***VT*** softkey (B).

– The pressure waveform (A) is replaced by a dialog window with ventilation settings (C).

– The key (D) is highlighted.



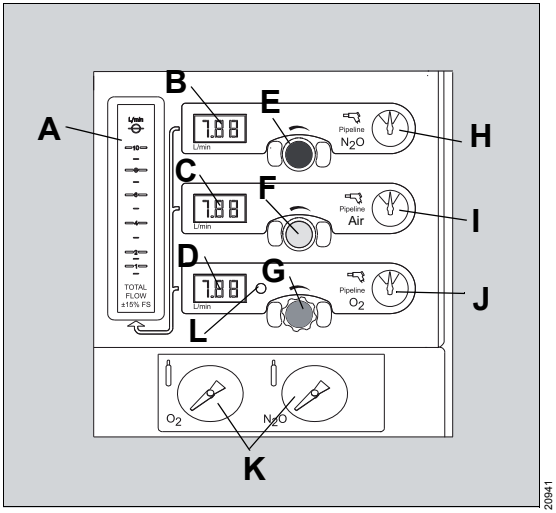
2 Select new value and confirm.

– The pressure waveform is displayed again.

NOTE

The time limit for changes of ventilation parameters is 15 seconds. After 10 seconds, an acoustic signal consisting of 3 tones is sounded. If the new setting is not confirmed within the time limit, the current ventilation settings remain effective. Instead of the window with the ventilation settings, the pressure waveform is again displayed.

Fresh-gas delivery (version for 3 gases)



The total flow tube and the pressure gauge are located on the front of the device below the screen.

There are 2 flow control valves for Air and O_2 on the gas mixer for 2 gases. There is a third flow control valve for N_2O on the gas mixer for 3 gases. All flow control valves are labeled and provided with a color coding, see chapter "Color coding for anesthetic agents and medical gases" on page 51.

The O_2 flow control valve is additionally provided with grooves on the gripping surface.

A Total flow tube that displays the sum of the individual flows of all used gases (O_2, Air, N_2O).

B Electronic N_2O fresh-gas flow display

C Electronic Air fresh-gas flow display

D Electronic O_2 fresh-gas flow display

E N_2O flow control valve

F Air flow control valve

G O_2 flow control valve

H Pressure gauge for the central N_2O supply

I Pressure gauge for the central Air supply

J Pressure gauge for the central O_2 supply

K Pressure gauges for gas cylinders (only for devices on trolley)*

L LED warning indicator for low O_2 pressure

If the pressure drops below 20 psi (1.4 kPa x100), the LED warning indicator lights up.

The displayed fresh-gas flow is in the range between 0 L/min and 12 L/min.

– If the value of the fresh-gas flow is higher than 12 L/min, the electronic fresh-gas flow display flashes (B, C, D).

– The field for electronic fresh-gas flow display shows "**+**".

NOTE

The electronic fresh-gas flow displays have an altitude adjustment.

* Use only with pin-index connections (not with screwed connections)

Total flow tube

NOTE

The total flow tube is calibrated for a mixture of N_2O and O_2 in a 50/50 ratio. The accuracy of the total flow tube might be reduced with other gas mixtures. More information can be found in chapter "Technical data" on page 182.

The total flow tube is used as a reference for the total volume of fresh gas that is introduced in the breathing system. The individual measured flow values for N_2O, Air, and O_2 are displayed on the respective electronic fresh-gas flow displays.

The total flow tube remains functional if the following faults occur:

– Fault in the electronic flow measurement
– Fault in the digital display
– Fault in the current switching circuit

In these cases, the measurement of the total flow tube indicates the total flow measured before the fault occurred.

To adapt the fresh-gas ratio during an existing fault, close all flow control valves and reset the individual flows one after another. The O_2 valve can remain open.

Example: After closing the flow control valves, the total flow tube indicates 2 L/min. This corresponds to an O_2 flow of 2 L/min.

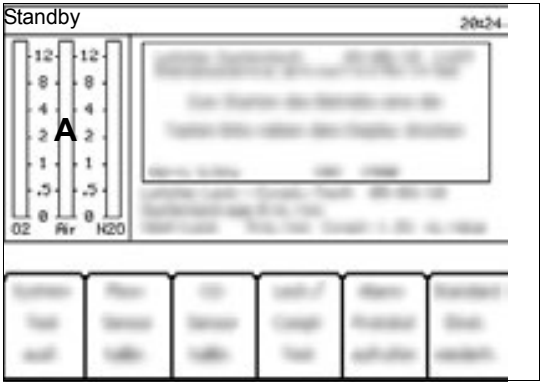
If 1 L/min N_2O is required, open the N_2O flow control valve until the total flow tube displays 3 L/min.

Monitoring resolutions for fresh-gas flow

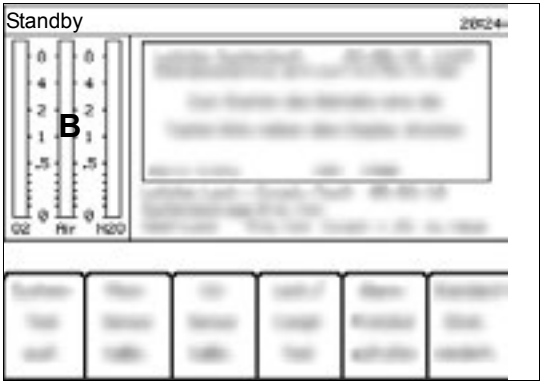
Fabius can be configured for the following resolutions of fresh-gas flow by DrägerService or the authorized local service partner:

– Standard resolution (A)
– High resolution (B)

If a flow is higher than 9.99 L/min, the standard resolution is activated.



If the standard resolution is configured, the electronic fresh-gas flow displays show the flow in increments of 100 mL/min (format xx.x L/min). The virtual flow tubes (A) of the screen indicate a range from 0 to 12 L/min.



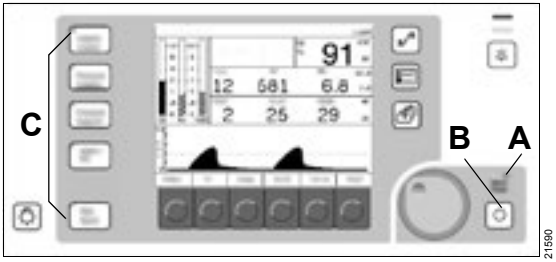
If a high resolution is configured, the electronic fresh-gas flow displays show the flow in increments of 10 mL/min (format x.xx L/min). The virtual flow tubes (B) of the screen indicate a range from 0 to 10 L/min.

If the respective flow again drops below 9.00 L/min, the high resolution is activated.

LED indicators

There are several LED indicators on the front of the device.

LEDs for operating status

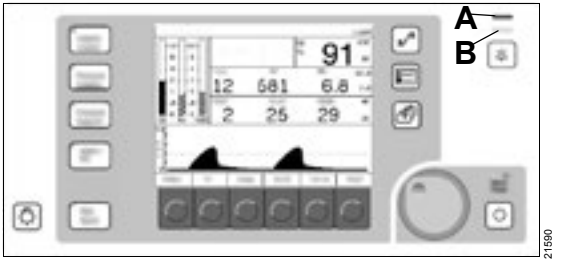


– If the device is connected to the mains power supply, the mains power LED (A) is lit.
– In addition, the standby key (B) and all keys of the ventilation modes (C) have small LEDs that light up when the respective mode is active.

LEDs for alarm status

Fabius has alarm LEDs that signal alarms and indicate the alarm priority. For additional information, see chapter "Alarms".

Alarm LEDs



– Red LED (A) flashing: signals a warning
– Yellow LED (B) flashing: signals caution
– Yellow LED (B) is lighted continuously: signals a note

Color coding for anesthetic agents and medical gases

The standardized color coding specified in ISO 5359 / ISO 32 / ISO 5360 is used for anesthetic agents and medical gases.

The colors for O_2, Air, and N_2O are adapted according to locally applicable standards.

Screen colors (optional)

For improved visibility, Fabius displays the following screen elements in different colors:

– Softkeys (default)

– Alarm messages (see chapter "Alarm priorities").

– Virtual flow tubes (setting according to country-specific gas color codes)

– Screen background (bright/dark)

The screen elements are only displayed in color if the option "Color display" is activated.

Assembly and preparation

Before first operation

Activating the battery

To prevent discharging of the battery during transport and during storage, the fuse of the battery is not connected with the device.

WARNING

Risk of device malfunction

If the battery is not sufficiently charged and the mains power supply fails, operation cannot be maintained long enough.

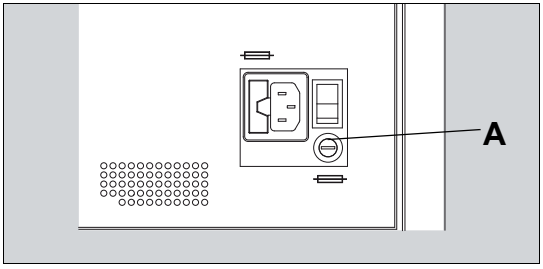
Before first operation or after storage, charge the battery for at least 8 hours.

WARNING

Risk due to reduced power supply from the internal battery

Batteries are wear parts. The capacity of the battery diminishes with the period of use.

Check the functional state of the battery by performing preventive maintenance on a regular basis.



1 Remove the battery fuse from its packaging.

2 Remove the fuse holder.

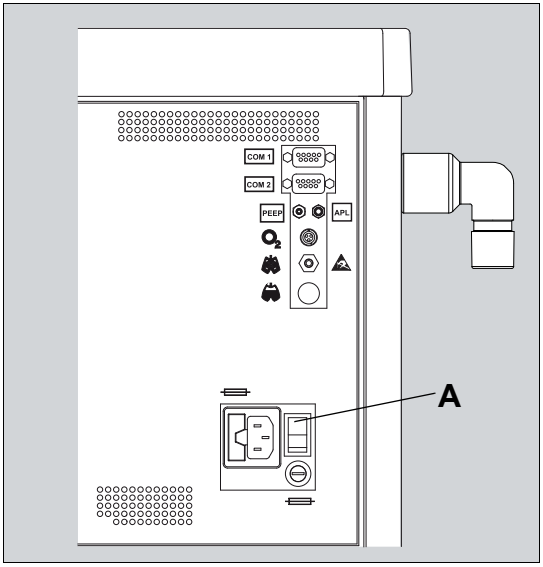
3 Insert the fuse (A) in the fuse holder.

4 Screw the fuse holder back in again with a quarter turn clockwise.

Connecting the mains power supply

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

100 V to 240 V



WARNING

Risk of electric shock and device malfunction

If the device is connected to a power socket with incorrect mains voltage or without a protective ground, the user can be injured and the device damaged.

Only connect the power cable to power sockets with a protective ground, see "Technical data".

NOTE

The mains plug must be freely accessible so that the power supply to Fabius can be quickly interrupted in the event of device failure.

1 Connect the power cable with the device.

2 Plug the power cable into the mains power socket on the wall.

LED on the front of the device lights up green.

3 Set On/Off switch (A) to position ⏺.

4 Check the status bar for the battery indicator.

Auxiliary power sockets

WARNING

Risk of electric shock

The connection of devices to auxiliary power sockets can lead to an increased leakage current. If the protective ground of one of these devices fails, the leakage current may rise above the permissible values.

- **Only connect with the approval of the respective device manufacturer.**
- **Have the leakage current checked by service personnel.**
- **If the permissible value is exceeded, use a mains power socket on a wall instead of the auxiliary power socket of the device.**

WARNING

Risk of device malfunction

If the mains power fails, devices connected to the auxiliary power sockets are not supplied from the uninterruptible power supply.

- **Do not connect any life-supporting devices to the auxiliary power sockets of the anesthesia workstation.**
- **Ensure an alternative power supply for connected devices.**

WARNING

Risk of device malfunction

If high-frequency surgical devices are connected to the auxiliary power sockets, the leakage current can damage the electronics of the medical device and lead to a failure.

Do not connect any high-frequency surgical devices to the auxiliary power sockets of the medical device.

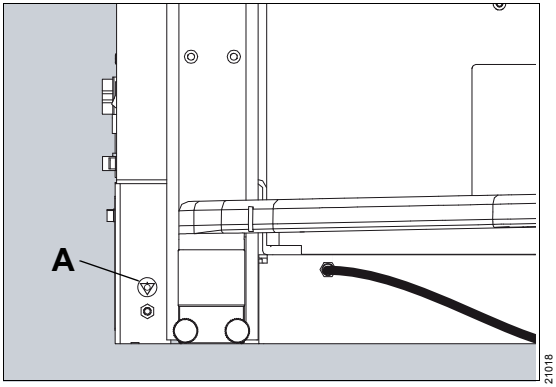
Establishing potential equalization

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

Potential equalization does not replace the protective ground connection.

In operation, the potential equalization connectors must be readily accessible and must be removable without tools.

Connecting the potential equalization cable



1 Connect the potential equalization cable to the potential equalization pin (A) on the left side (front view).

2 Connect the potential equalization cable to a potential equalization connector of the hospital (e.g., wall, ceiling supply unit, operating table).

3 Establish potential equalization to the auxiliary devices.

NOTE

If the good condition of the protective ground or its correct connection with the medical device cannot be ensured, the device must be operated via the internal power supply (battery).

Connecting the gas supply

WARNING

Risk due to gas supply failure

All gas supplies (central gas supply, gas cylinders) must be correctly connected since otherwise the backup system (gas cylinders) will not be available if gas supply fails.

- **Make sure that all compressed gas hoses are correctly connected to the rear side of the device.**
- **After connecting the gas supply, check for correct function.**
- **Even when the anesthesia machine is connected to the central gas supply, the gas cylinders should remain at the device with valves closed as backup.**

WARNING

Risk of contamination of ambient air and risk of fire/explosion

O_2 or N_2O can get into the ambient air as a result of leakages.

- **Make sure the compressed gas hoses are connected properly.**
- **Avoid and remedy all leakages.**
- **Ensure sufficient ventilation of the room.**
- **Use an anesthetic gas scavenging system.**

Central gas supply

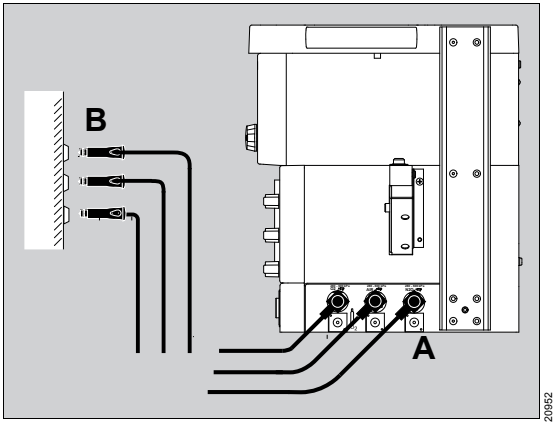
Version for 3 gases

WARNING

Risk to patient through incorrect gas connection

If the connections of the central gas supply hoses between the central gas supply and Fabius are interchanged, serious accidents can occur.

If Fabius is connected to the central gas supply, it must be checked whether the marks on the hoses agree with the connections of the central gas supply.



1 Screw the connection piece of every individual central gas supply hose hand-tight on the corresponding connection (A) on the device side.

2 Plug the probes of the central gas supply hoses in the appropriate wall terminal units (B).

3 Check if all central gas supply hoses are correctly connected.

CAUTION

Risk of insufficient gas pressure

If the supply pressure of the central gas supply is too low, the functionality of the anesthesia workstation is compromised.

The pressure gauge of the individual gases must display a constant pressure between 41 and 87 psi (2.8 and 6 kPa x 100).

NOTE

A failure of the gas supply can lead to a failure of the connected devices.

Gas cylinders with pin-index system (optional)

WARNING

Risk due to incorrect mounting of the gas cylinder

When using several sealing washers between the gas cylinder and the gas inlet of the cylinder holder, the pin-index safety system is compromised.

If a gas cylinder is connected, always check whether the pin-index pins are present. Never attempt to bypass the pin-index safety system.

WARNING

Risk of explosion

If the gas cylinder valves are opened too quickly, a sudden increase in pressure may occur.
- **Open and close the gas cylinders valve slowly by hand.**
- **Do not use tools.**

CAUTION

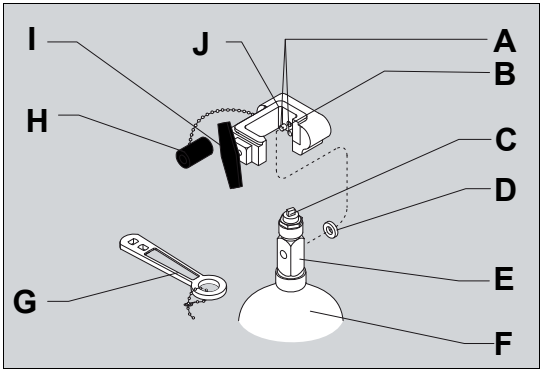
Risk due to gas supply failure

Leave gas cylinders as a backup at the anesthesia workstation, even if there is a connection to the central gas supply.

NOTE

Leaky and stiff gas cylinder valves must be repaired according to manufacturer's specifications.

Connecting the gas cylinders



1 Remove the old sealing washer (D).

2 Insert a new sealing washer (D) at the cylinder holder (J).

3 Make sure that both pin-index pins (A) are present below the gas inlet (B).

4 Align the gas cylinder (F) so that the pin-index holes on the cylinder head (E) are pointing towards the pin-index pins (A) on the cylinder holder (J).

5 Insert the cylinder head (E) of the gas cylinder (F) from below into the cylinder holder (J).

6 Allow the pin-index pins (A) to engage in the pin-index holes.

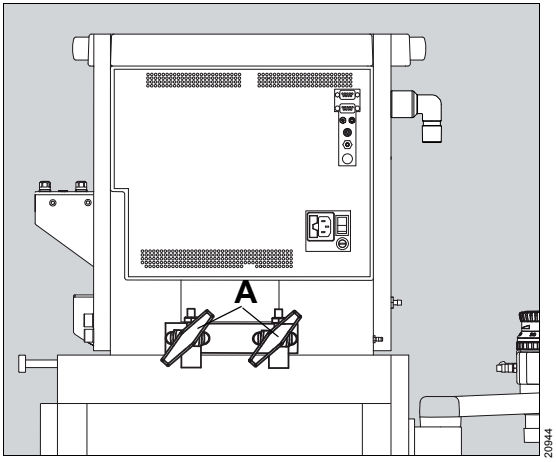
7 Turn the handle (I) on the cylinder holder (J) clockwise. The tip of the threaded retaining pin will then be turned into the visible recess on the cylinder head. Make sure that the gas cylinder is suspended vertically.

8 Tighten the handle (I) of the cylinder holder (J).

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

If the gas cylinder is removed, insert the plug (H) in the mounted gas cylinder holder and tighten.

Checking the gas cylinders



The pressure specifications are based on gas cylinders of size E at 21 °C/70 °F. If the pressure in a gas cylinder does not reach the recommended minimum pressure (PSI - MIN), the gas cylinder must be replaced by a full gas cylinder.

Gas	PSI - FULL (kPa x 100 - FULL) (normal full load)	PSI - MIN (kPa x 100 - MIN)
Air	1900 (131)	1000 (69)
N_2O	745 (51)	600 (42)
O_2	1900 (131)	1000 (69)

1 Open cylinder valves (A).

Make sure that the pressure gauges on the gas cylinders indicate the appropriate pressure recommended in the following table.

No hissing must sound when opening the cylinder valves.

In this case, the connection is leaking. The gas cylinder must be mounted again.

2 Close the cylinder valves again.

Maximum permissible dimensions of the gas cylinders

Gas cylinder connection	Left		Right	
	Ø	Length [mm]	Ø	Length [mm]
Pin-index	Max. 105	800	Max. 105	800
Pressure reducers	102/142	800	102/142	800
Min. Ø of gas cylinder	85/110		85/110	

Observe the following points:

– Do not exceed the maximum length of the gas cylinder including the pressure reducer/pin-index connection.

– The gas cylinders must not protrude over the lower edge of the trolley (observe maximum length of the gas cylinders).

– The O_2 cylinder must not be mounted on the right side (looking from the rear).

Gas cylinders with screw connections (optional)

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 of the O_2 cylinder. Do not touch with oily or greasy fingers.

WARNING

Risk of explosion

If the gas cylinder valves are opened too quickly, a sudden increase in pressure may occur.
- **Open and close the gas cylinders valve slowly by hand.**
- **Do not use tools.**

CAUTION

Risk due to gas supply failure

Leave gas cylinders as a backup at the anesthesia workstation, even if there is a connection to the central gas supply.

CAUTION

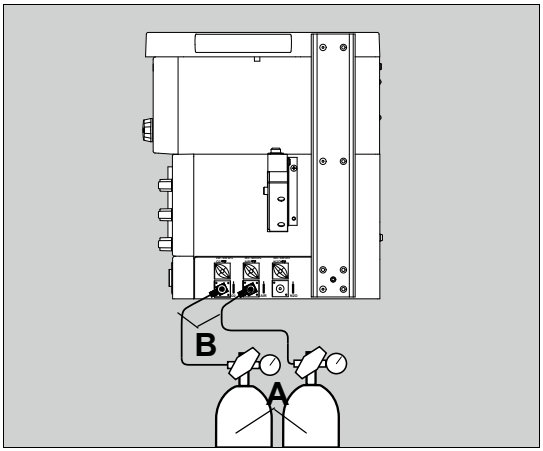
Risk of patient injury

Do not connect gas cylinders without the pressure reducers listed in the current list of accessories.

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

NOTE

Keep gas cylinders closed as long as they are not being used. There is the risk of accidental emptying of the gas cylinders.



WARNING

O_2 gas cylinders must not be mounted on the right side of the device (looking from the rear).

1. Place the full gas cylinders (A) in the cylinder holder and secure them.
2. Connect the pressure reducers to the cylinder valves. The connections must fit directly to each other. Do not use transition pieces.
3. Screw the compressed gas hoses (B) to the pressure reducers and to the connections of the gas supply block.
4. Open the cylinder valves.

Mounting the anesthetic vaporizers

Depending on the configuration, Fabius can be operated with vaporizers that have a plug-in adapter for Selectatec or Interlock S compatible connectors. The anesthetic vaporizers must be mounted in accordance with the respective instructions for use.

The vaporizers in use must comply with applicable safety standards.

If an independent gas measurement system is used, it must comply with applicable safety standards.

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.

- **Strictly observe the instructions for use of the vaporizer.**
- **Compare the color coding on the vaporizer with the anesthetic agent bottle.**

WARNING

Risk due to improperly mounted vaporizers

Incorrectly mounted vaporizers can cause leakage. This can cause the fresh-gas flow to be too low or contaminate the ambient air. Patient and user can be endangered.

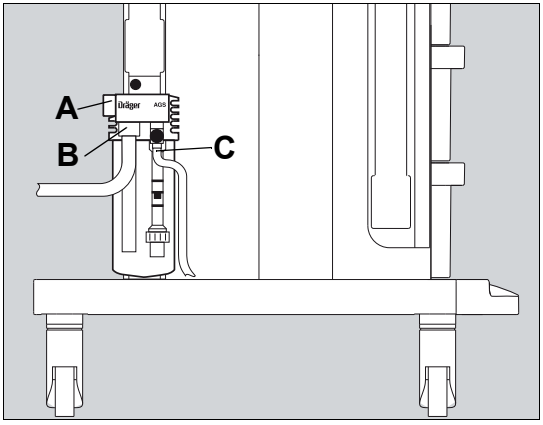
- **Make sure that the vaporizers are mounted levelly.**
- **When using D-Vapor vaporizers, make sure that the power cable is not pinched.**
- **After mounting the vaporizers, perform a leakage test.**

Ensuring the gas supply

Connecting the anesthetic gas receiving system (optional)

The anesthetic gas receiving system, in combination with Dräger anesthesia workstations and their modules, meets the requirements of general safety standards.

The anesthetic gas receiving system does not work as a stand-alone system, but is used as one of 3 components of an anesthetic gas scavenging system (AGSS).



1 Fit the receiving system, with the slots resting on the corresponding pegs, on Fabius and slide down.

2 Use the screw plug (A) to seal the connection not in use.

3 Slide the transfer hose (B) to the provided port.

4 Connect the other end of the transfer hose to the exhaust port on the bottom of the COSY.

5 Connect the scavenging hose (C) to the corresponding port of the receiving system.

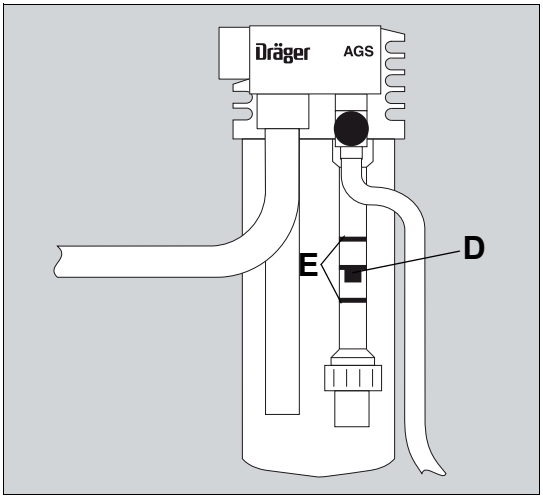
6 Connect the probe of the scavenging hose (C) to the terminal unit of the anesthetic gas scavenging system. Observe the associated instructions for use of the AGSS terminal unit.

WARNING

Risk of patient injury

If the side openings of the anesthetic gas receiving system are blocked, this can lead to a lack of fresh gas in the breathing system.

Make sure that the side openings of the receiving system are not blocked.



The top edge of the float (D) in the flow tube must move between the two marks (E).

More information can be found in the instructions for use (9038579) of the anesthetic gas receiving system.

Assembling the breathing system

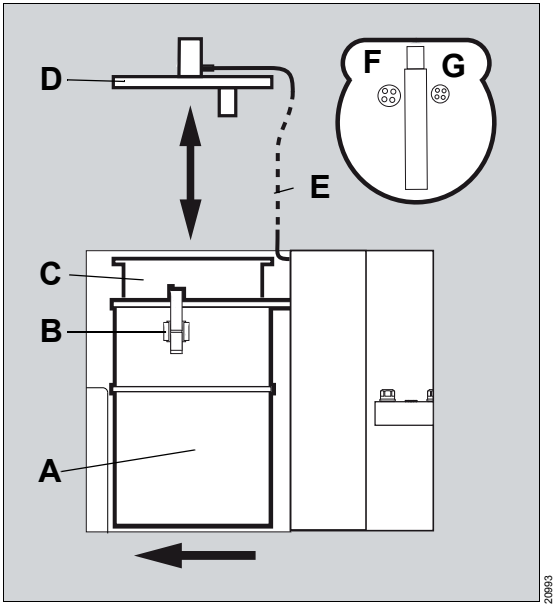
WARNING

Risk of insufficient anesthetic gas concentrations

If the component connections of the breathing system are not leak-tight enough, ambient air may get into the breathing gas.

Make sure that all components of the breathing system are connected tightly.

Preparing the ventilator



Only disinfected and sterilized components must be used.

1 Open the ventilator door (A) with the attached ventilator unit.

2 Release the 3 clamps (B).

3 Remove the cover (D).

4 Insert the ventilator membrane (C). After assembly, the Dräger inscription must be visible.

5 Fit the cover (D) and close the 3 clamps (B).

6 Connect the pressure sensor line (E) of the ventilator chamber with the appropriate connector.

7 Close the ventilator door with the attached ventilator unit.

Safety functions of the ventilator

– Overpressure safety valve (F)
– Underpressure safety valve (G)
– Pressure sensor in the ventilator chamber

Mounting the CO_2 absorber to the compact breathing system

WARNING

Risk of high inspiratory CO_2 values

If the soda lime is used too long, carbon dioxide can no longer be completely absorbed.

Check the color of the soda lime regularly, especially if the inspiratory CO_2 value increases unexpectedly. Replace if necessary.

WARNING

Risk due to soda lime drying out

The soda lime loses moisture. If the moisture falls below the minimum moisture, the following adverse reactions occur independent of the type of soda lime and inhalational anesthetic used: Decreased CO_2 absorption, increased generation of heat in the CO_2 absorber resulting in increased breathing gas temperature, formation of CO, absorption and/or degradation of the inhalational anesthetics.

- **Do not use unnecessarily high fresh-gas flows.**
- **Only use the supplemental O_2 delivery if necessary.**
- **Do not leave the flow control valves open unnecessarily long.**

WARNING

Do not use soda lime based on potassium hydroxide. Otherwise, there is a risk of CO formation.

NOTE

Only use pelletized soda lime. Otherwise, there is a risk of faulty measurement or incorrect delivery and progressive damage to the breathing system due to dust.

If conventional, non-pelletized soda lime is used, then a soda lime dust filter must be used.

Reusable CO_2 absorber

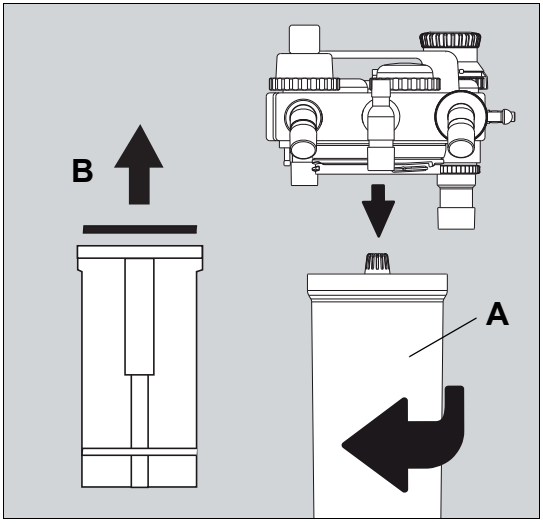
CAUTION

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.

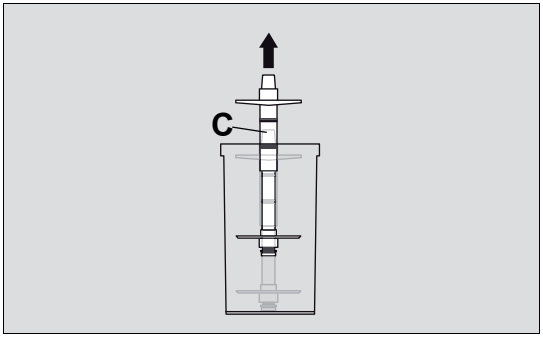
Dismounting and emptying



1 Turn the CO_2 absorber (A) clockwise and remove it from below.

2 Remove and dispose of the soda lime dust filter* (B).

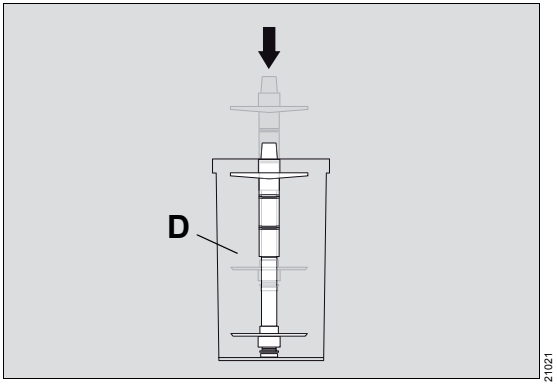
3 Empty used soda lime and dispose of according to the instructions for use.



4 If it is necessary to clean the absorber insert (C), remove the absorber insert from the absorber container. Leave the inner and outer sealing rings on the absorber insert.

* optional

Filling and mounting



1 After any cleaning, push the absorber insert back into the absorber container (D) completely.

2 Fill CO_2 absorber with fresh soda lime to the upper mark.

Dräger recommends the use of
Drägersorb 800 Plus or Drägersorb FREE.

WARNING

Risk of hypoventilation

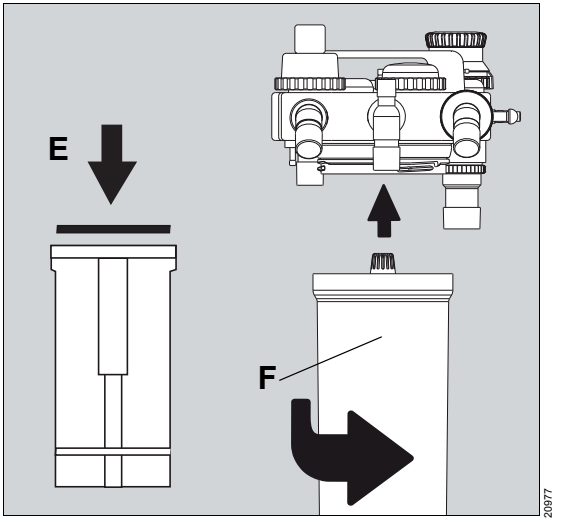
Reuse of the soda lime dust filter can increase filter resistance and impair the ventilation function of Fabius.

Replace the soda lime dust filter each time the soda lime is replaced.

NOTE

Make sure that no soda lime residues are between the seals and the seal surfaces. This type of residue can cause system leakages.

If conventional, non-pelletized soda lime is used, then a soda lime dust filter* must be used.



3 Insert a new soda lime dust filter (E). Only use soda lime dust filters indicated in the list of accessories.

Only use undamaged filters, as exterior damage to the filter decreases protection!

4 Place the CO_2 absorber (F) below the compact breathing system in position and turn counterclockwise to the final position stop.

CAUTION

Risk of patient recovering consciousness

If the CO_2 absorber is not correctly locked into place, system leakage may occur.

Make sure that the absorber container is connected tightly to the compact breathing system during the ventilation.

* optional

Disposable CO_2 absorber with Drägersorb CLIC (optional)

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

CLIC adapter allows the following single-use CO_2 absorbers to be used:

– CLIC Absorber 800+
– CLIC Absorber Free
– Infinity ID CLIC Absorber 800+
– Infinity ID CLIC Absorber Free

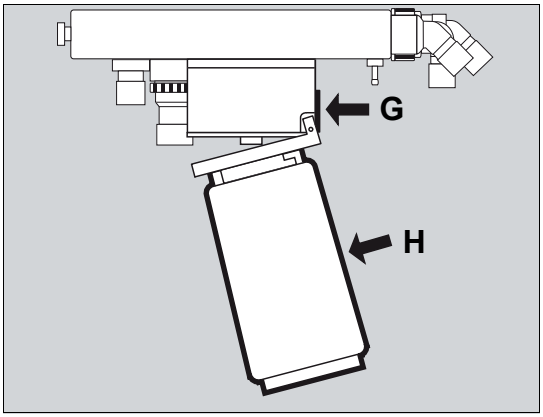
More information on the connection of Drägersorb CLIC-Adapters can be found in the associated instructions for use.

WARNING

Risk of insufficient ventilation

If the CO_2 absorber is not correctly locked into place, system leakage may occur. The CO_2 absorber must audibly engage before Fabius is switched on. This ensures that the CO_2 absorber is included into the leakage test and compliance test of the device.

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



1 Press the button (G): The CLIC adapter flips open.

2 Loosen the soda lime in the disposable CO_2 absorber, e.g., turn over the disposable CO_2 absorber a few times.

3 Remove the seal of the new disposable CO_2 absorber. Push the disposable CO_2 absorber in the Clic adapter.

4 Push the disposable CO_2 absorber (H) upwards into the CLIC adapter, until the CLIC adapter engages.

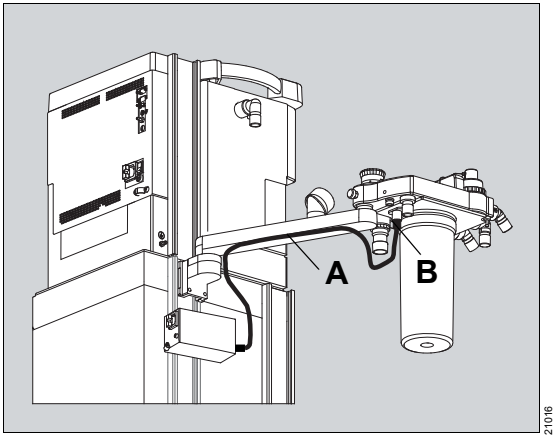
Mounting the COSY heating and the power supply unit (optional)

The compact breathing system can be operated heated. This reduces the condensation of moisture in the breathing system during low-flow operation (fresh-gas flow less than 1 L/min).

- Before installation of the COSY heating, the leakage test must be performed, see chapter "Leakage test" on page 128.

Follow the assembly instructions for breathing system heating (9038262 and 8605899).

Establishing the power supply of the breathing system heating



1 Plug in the connector of the heating cable (A) in the corresponding socket (B) on the bottom of the compact breathing system. When doing so align the red mark of the plug to the red mark of the socket.

- After installation of the breathing system heating, perform the leakage test on Fabius.

If the heating is not used, it must be switched off to prevent the soda lime from drying out.

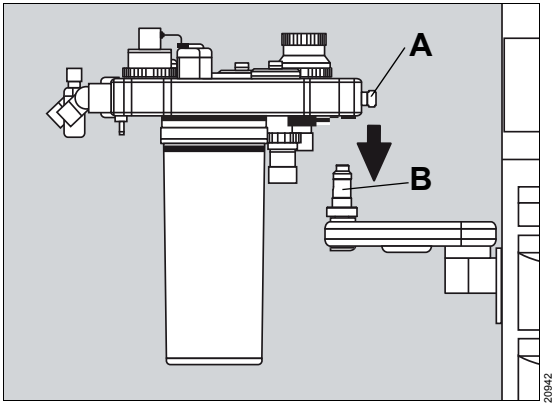
WARNING

Risk due to soda lime drying out

The soda lime loses moisture. If the moisture falls below the minimum moisture, the following adverse reactions occur independent of the type of soda lime and inhalational anesthetic used: Decreased CO_2 absorption, increased generation of heat in the CO_2 absorber resulting in increased breathing gas temperature, formation of CO, absorption and/or degradation of the inhalational anesthetics.

- **Do not use unnecessarily high fresh-gas flows.**
- **Only use the supplemental O_2 delivery if necessary.**
- **Do not leave the flow control valves open unnecessarily long.**

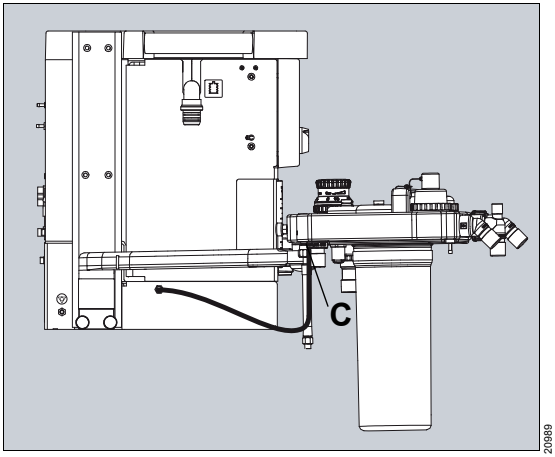
Connecting the compact breathing system



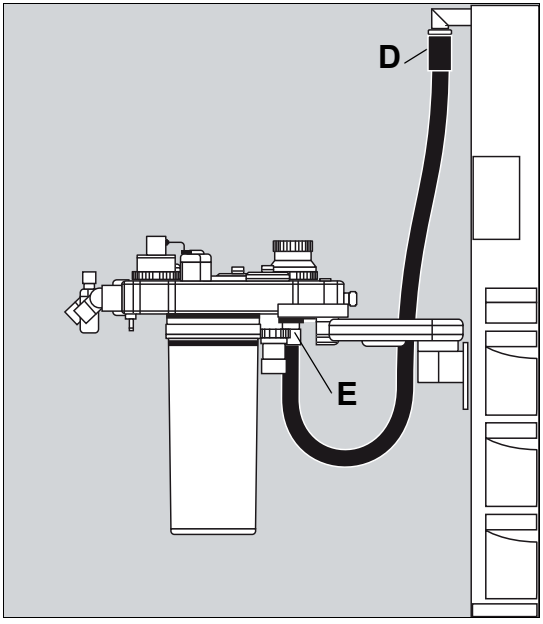
1 Completely pull out the locking pin (A) and hold it in that position.

2 Insert the assembled compact breathing system in the provided holder (B).

3 Release the locking pin again and turn the compact breathing system until the locking pin engages.



4 Connect the fresh-gas hose (C) to the corresponding connection of the compact breathing system.



5 Connect the ventilator hose to the corresponding connector (D) on the anesthesia workstation.

6 Connect the other end of the ventilator hose to the ventilator connector (E) of the compact breathing system.

If Fabius has a screw connection, the sealing rings of this screw connection must be undamaged and clean.

Only hand-tighten the screw connection. Do not use tools.

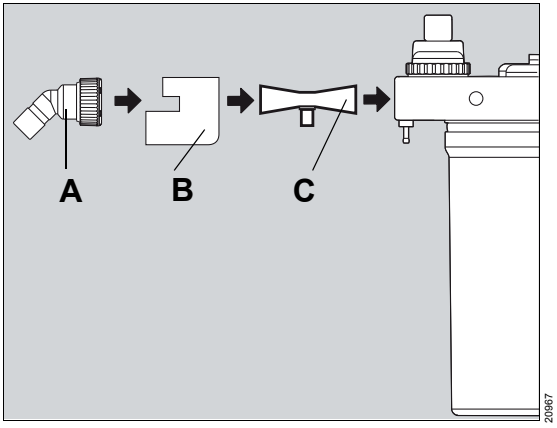
Inserting the flow sensor

WARNING

Risk of fire

Residual vapors of easily flammable disinfectants (e.g., alcohols) and deposits that were not removed during reprocessing can ignite when the flow sensor is in use.

- **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 Screw out the expiratory port (A).

2 Remove the flow-sensor guard* (B).

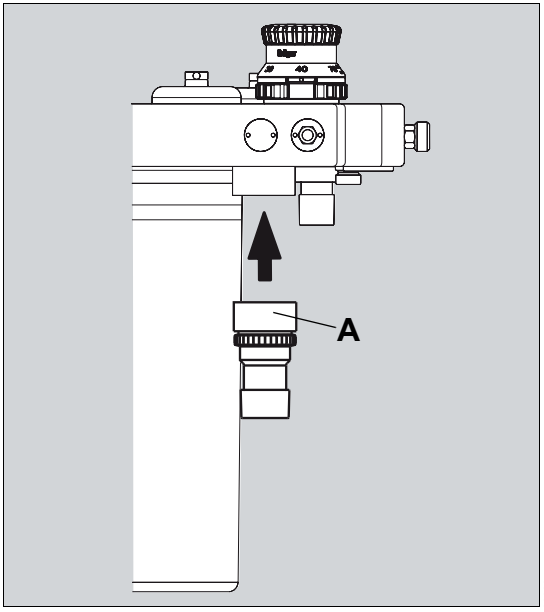
3 Insert the flow sensor (C).

4 Replace the flow-sensor guard* (B).

5 Screw the expiratory port (C) back on.

* optional

Connecting the exhaust port



- Screw on the exhaust port (A) in the compact breathing system from below.

Connecting the breathing bag

WARNING

Risk of use of toxic or incompatible materials

The breathing bag used must comply with the current standards.

WARNING

Risk of too high airway pressure or insufficient fresh-gas

If the breathing bag is pinched, excessive airway pressures or a lack of fresh gas can occur.

Attach and position the breathing bag so that it is not pinched and can inflate freely.

CAUTION

Risk of patient recovering consciousness

A blocked or incorrectly positioned breathing bag can lead to lack of fresh gas for patients. Manual ventilation is also not possible.

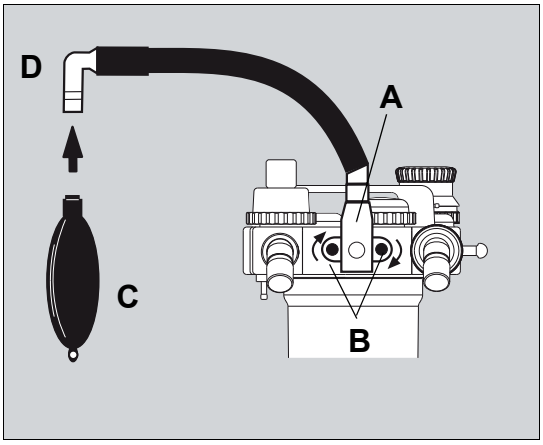
Make sure that the breathing bag is connected tightly to the bag holder during the ventilation.

The breathing bag can be mounted to the compact breathing system with the following variants:

– On a flexible arm
– On a rigid arm
– On the bag elbow directly on the compact breathing system

Mounting the flexible arm

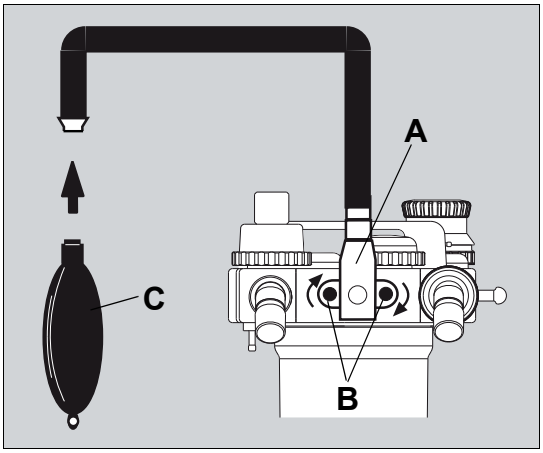
Prerequisite: Before mounting the flexible breathing bag holder, the bag elbow on the compact breathing system must be removed.



1. Position and align the connection adapter (A) of the flexible arm on the connection of the compact breathing system.
2. Tighten the knurled screws (B). Check that the arm is fixed securely.
3. Fasten the elbow (D) at the end of the flexible arm.
4. Fasten the breathing bag (C) on the other end of the elbow.

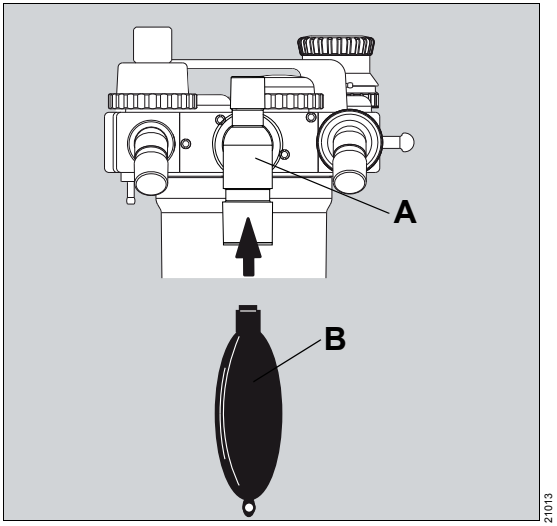
Mounting the rigid arm

Prerequisite: Before mounting the rigid breathing bag holder, the bag elbow on the compact breathing system must be removed.



1. Position and align the connection adapter (A) of the rigid arm on the connection of the compact breathing system.
2. Tighten the knurled screws (B). Check that the arm is fixed securely.
3. Fasten the breathing bag (C) at the other end of the rigid arm.

Mounting the bag elbow



1 Attach the bag elbow (A) on the connection of the compact breathing system.

2 Attach the breathing bag (B) on the connector of the bag elbow.

Connecting the endotracheal suction system (optional)

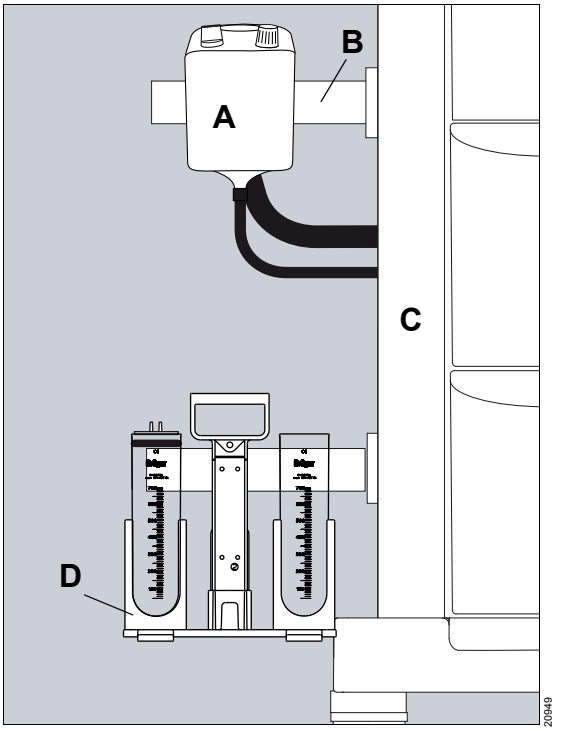
The endotracheal suction system for Fabius consists of:

– Suction regulator (A)

– Suction bottles (D)

1 The suction regulator (A) is attached to a holder (B). The holder is fastened on the side GCX rail (C) on Fabius.

2 The suction bottle (D) is attached to a separate holder.



Suction systems used

When using an ejector suction with drive gas:

- Connect the Air connection hose of the suction system via a 3-way adapter to the gas supply block or the central gas supply.

For vacuum suction:

- Connect the vacuum hose of the suction system directly to the central gas supply.

Prepare the suction system in accordance with the associated instructions for use.

WARNING

Risk of patient injury

Only use the suction system if the ventilation mode *ManSpont* is active or the patient is disconnected from the Y-piece.

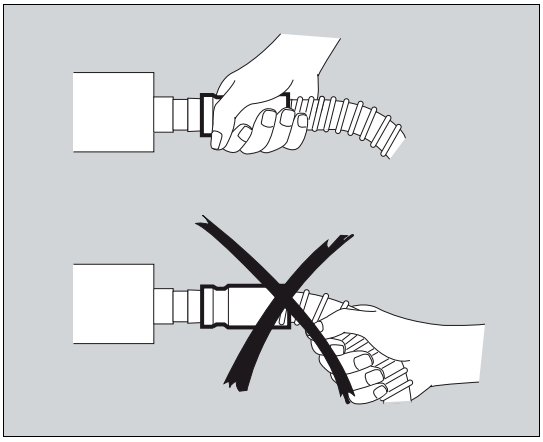
Connecting the breathing hoses and the filters

WARNING

Risk of burns

Conductive breathing hoses or face masks can cause burns during HF surgery.

Do not use this type of hose and mask combined with HF surgery.



CAUTION

Risk to patients by damaged breathing hoses

If the coil reinforcement of a breathing hose is damaged, there is risk of kinking or occlusion.

When attaching or removing the breathing hoses, always hold them at the connection sleeve and not at the coil reinforcement. Otherwise the coil reinforcement can become separated from the connection sleeve. Check the breathing hoses for damage before each use.

WARNING

Risk of strangulation

Negligent placement of hoses, cables, and similar device components can endanger the patient.

Use particular caution when establishing connections to the patient.

WARNING

Risk of use of toxic or incompatible materials

The breathing hoses must comply with the current standards.

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 patient-side filter or a filter at the inspiratory port.

NOTE

If it is not possible to use an expiratory filter (e.g., due to an intrinsic PEEP due to air trapping), hygienically reprocess the device after use with this patient, see chapter Cleaning, disinfection and sterilization.

WARNING

Risk of infection

If no microbial filter is used, the breathing system may become contaminated with disease-causing germs.

In this case, hygienically reprocess the breathing system after each patient.

NOTE

Fabius contains no components made of natural rubber latex.

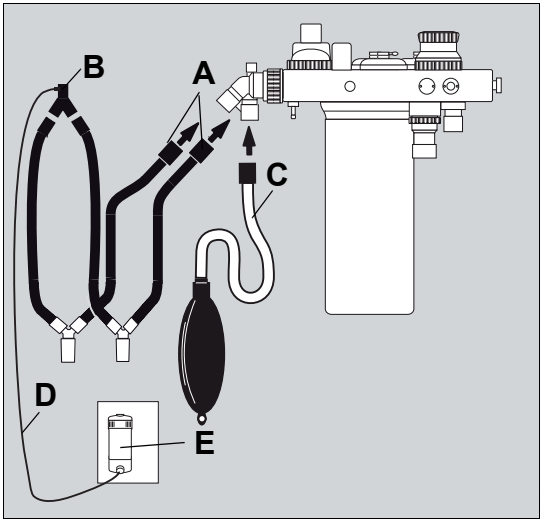
For latex-free use, use a latex-free breathing bag and breathing hoses.

1 Select suitable accessories for the respective patient category.

	Adults		**Pediatric patients**	**Neonates**
Tidal volume	>700 mL	201 to 700 mL	50 to 200 mL	<50 mL
Breathing bag	3 L	2 L	1 L	0.5 L
Breathing circuit	Adults		Pediatric	Neonates (or pediatric)
Filter	Filter, HMEF, or HME			Use filters with low resistance and compliance.

NOTE

When applying tidal volumes in the range of the maximum or minimum values indicated for each patient category, use the smaller breathing bag and the smaller breathing circuit.



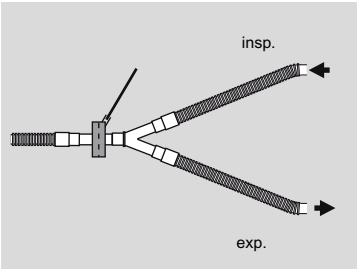
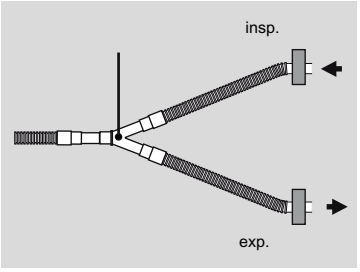
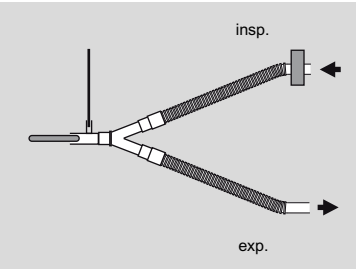
2 Connect a breathing hose (A) on each of the inspiratory port and expiratory port, optional with microbial filter installed.

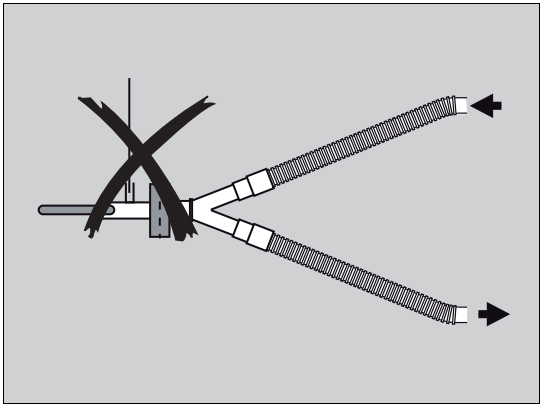
3 Connect both breathing hoses on the Y-piece (B).

4 Connect the sample line (D) to the connector of the Y-piece (B) and to the connector of the water trap (E) on the patient-gas measurement module.

5 Connect the breathing bag hose (C) with the breathing bag to the corresponding connector.

Table with recommended hose configurations*

Adults	Pediatric patients	Neonates
Filter or HMEF with connection for sample line between Y-piece and patient:  Or Filter at inspiratory port and expiratory port, connection for sample line at Y-piece: 		Filter at inspiratory port, connection for sample line as close to patient as possible:  Lateral connections for the sample line support CO_2 measurement and help to flush the dead-space between Y-piece and hose adapter.



WARNING

Risk of underpressure in the lungs

If filters are blocked, the sample gas flow can immediately cause underpressure in the lungs.

When ventilating pediatric patients and neonates, do not use HMEF or other filters at the Y-piece in connection with a hose adapter that have a patient-side connection for a sample line.

* The resistance of the breathing system and connected accessories must be observed.

For measurement purposes, a permanent sidestream flow flows through the sample line to the patient-gas measurement module. With blocked HME filter or filter in this position on the Y-piece, the measurement system will cause underpressure situations in the patients lungs.

Observing the resistance and compliance

WARNING

Risk due to accessory components in breathing circuit

When using additional components or hose configurations which deviate from the standard breathing circuit, the inspiratory and expiratory resistance values may be increased beyond standard requirements.

When using such configurations, the user must pay special attention to the measured values.

WARNING

Risk of increased rebreathing

Leakages between the inner and outer hose of a coaxial breathing circuit cannot be detected during the leakage test.

To prevent insufficient gas exchange or CO_2 rebreathing, pay strict attention to the measured gas concentration.

CAUTION

Risk due to misleading data

Replacing breathing hoses, filters, vaporizers, or soda lime can change the determined leakage values and compliance values of the anesthesia machine and thus affect therapy.

– Perform a leakage test and compliance test after replacing breathing hoses, particularly flex hoses, vaporizers, or soda lime.
– Perform a leakage test and compliance test after changing the length of extendable hoses.

CAUTION

Risk due to changed hose lengths

Changed hose lengths can change resistance and compliance. For neonates, this can cause increased or reduced breathing volumes.

For neonates in particular, do not use flex hoses.

Higher resistance values during spontaneous breathing lead to an increased work of breathing in the patient.

During volume-controlled ventilation, an increased resistance during inspiration has a slight effect on the applied volume. The peak pressure increases, however, with constant plateau pressure. Therefore, the time constant increases during the expiratory phase. When applying too short expiratory times, this can lead to an incomplete emptying of the lungs. This leads to a dynamic overinflation of the lungs (airtrapping).

During pressure-controlled ventilation, an increased resistance can decrease the inspiratory and expiratory volumes.

Before performing the selftest, all accessories* to be used must be connected. Extendable hoses must be pulled out to the length intended by the user. Only in this way is the compliance correctly determined and with volume-controlled ventilation a correct tidal volume applied.

* If necessary, take additional parts such as water traps or additional hoses in consideration.

Calculating the resistance of the breathing system and connected accessories

To keep the patients' work of breathing as low as possible, according to general safety standards a total inspiratory and expiratory resistance of 6.0 hPa (cmH_2O) at 60 L/min must not be exceeded.

The chapter "Breathing system" contains the inspiratory and expiratory resistance values of the breathing system without taking into consideration the breathing hoses. In this manner it is possible to determine the respective resistance of the patient when using different breathing hose sets and/or filters.

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

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

$R_{Expiration} = R_{Breathing\ system\_exsp} + R_{Exsp\ hose} + R_{Exsp\ filter(port)} + R_{Exsp(Y-piece)}$

Make sure that for the calculation of the resistance only the accessories resistance values and the peak flows are used for the respective accessory category and patient category, e.g., resistance values for adults at 60 L/min, for children at 30 L/min, and for neonates at 5 L/min.

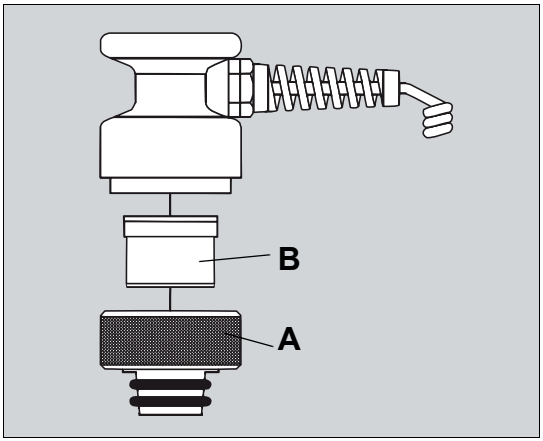
Inserting a new O_2 sensor capsule

WARNING

Risk of electric shock

If the O_2 sensor is replaced during operation, it can lead to transferring of leakage current.

Do not touch the patient.



1. Remove the O_2 sensor housing from the inspiratory valve.
2. Unscrew the screw cap (A) from the O_2 sensor housing.
3. Take the new O_2 sensor capsule from the package.
4. Place the O_2 sensor capsule (B) in the housing so that the ring-shaped conductor touches the contacts in the housing.
5. Screw on the screw cap (A) tightly by hand.
6. Reinsert the O_2 sensor housing in the inspiratory valve.

WARNING

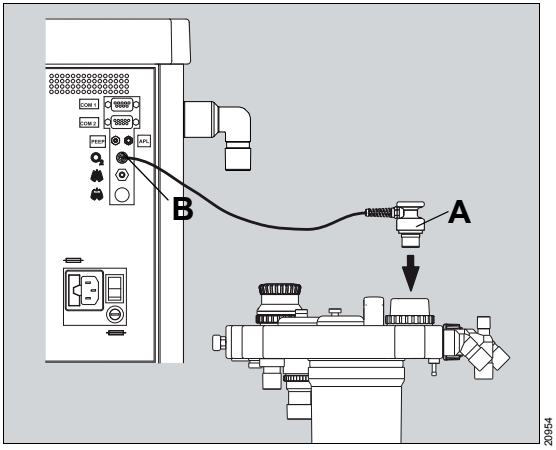
Danger of erroneous O_2 measurement.

An incorrectly mounted O_2 sensor will lead to incorrect measurement results.

Make sure that the O_2 sensor is inserted correctly in the inspiratory valve, see page 21.

Connecting the sensors and measurement lines

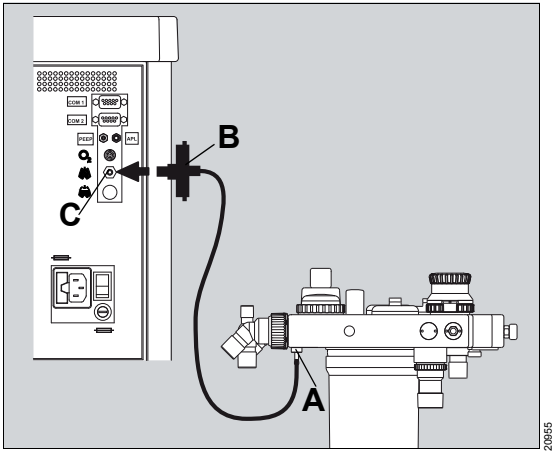
Connecting the O_2 sensor



1 Insert the O_2 sensor (A) into the opening of the inspiratory valve on the compact breathing system.

2 Connect the plug (B) of the O_2 sensor cable with the connection marked with O_2 on the rear of the device.

Connecting the pressure sensor



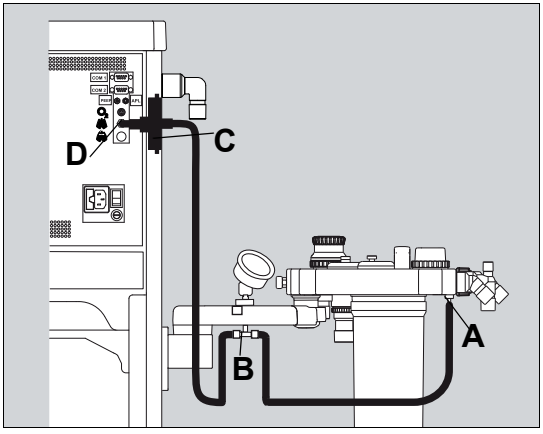
1 Connect the pressure measurement hose to the corresponding connector (A) on the bottom of the compact breathing system.

Make sure that the pressure measurement hose is not pinched.

2 Connect the other end of the pressure measurement hose to the bacterial filter (B).

3 Plug in the bacterial filter into the connection (C) marked with on the rear of the device.

Connection of the pressure gauge for measurement of the airway pressure (optional)



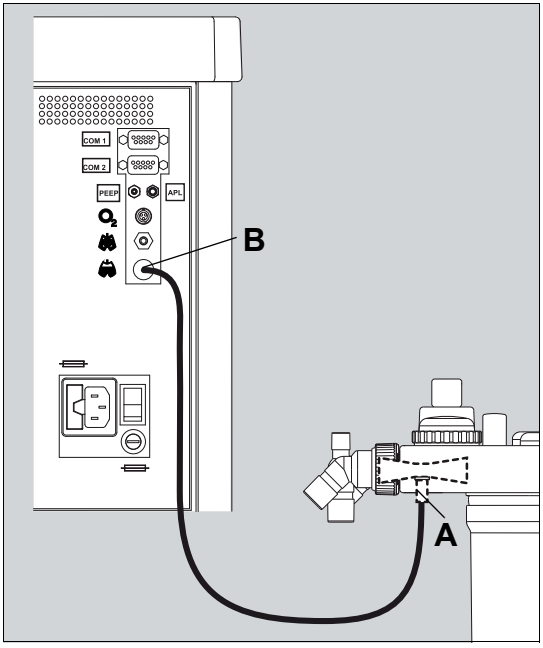
1 Connect the pressure measurement hose to the corresponding connector (A) on the bottom of the compact breathing system.

2 Connect the T-piece (B) with the pressure measurement hose and the pressure gauge.

3 Connect the other end of the pressure measurement hose to the bacterial filter (C).

4 Plug in the bacterial filter into the connection (D) marked with on the rear of the device.

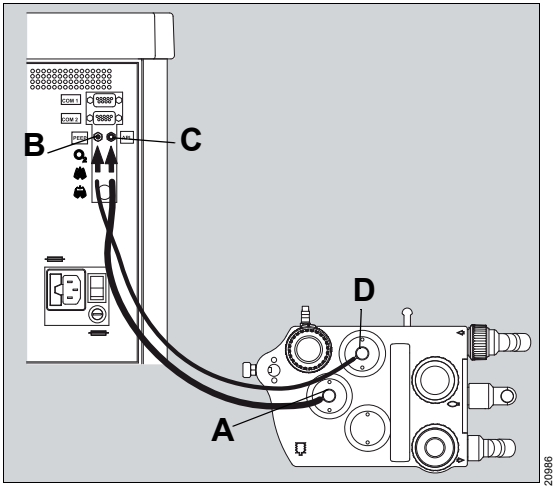
Connecting the flow sensor



1 Connect the flow sensor cable to the corresponding connection (A) on the bottom of the compact breathing system.

2 Plug in the other end of the flow sensor cable into the connection (B) marked with on the rear of the device.

Connecting the APL bypass hose and PEEP/PMAX hose



1 Connect the APL bypass hose to the corresponding connection port of the APL bypass valve (A) on the compact breathing system.

2 Connect the other end of the hose to the connection marked with ***APL*** (C) on the rear of the device.

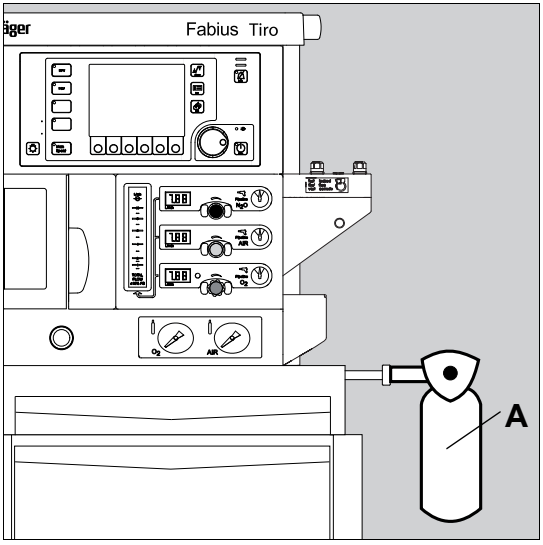
3 Connect the PEEP/PMAX hose to the corresponding connection port of the PEEP/PMAX valve (D) on the compact breathing system.

4 Connect the other end of the hose on the connection marked with ***PEEP*** (B) to the rear of the device.

NOTE

The APL bypass hose is thicker than the PEEP/PMAX hose.

Fastening the manual resuscitator



For wall-mounted devices, the transport rail is located on the holder.

1 Hang the completely prepared and functionally checked manual resuscitator (A) to the right on the transport rail.

Instructions for mounting the accessories

CAUTION

Observe the assembly instructions of the accessory.

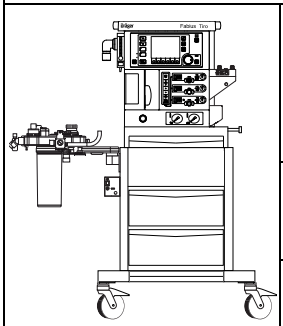
WARNING

Risk of tipping and risk of injury

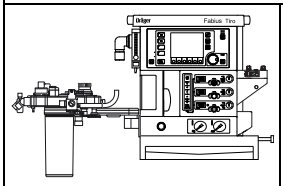
If the maximum permissible weight is exceeded or if monitors and other auxiliary devices are placed on the medical device, the device can fall. Especially if the medical device is rolled over door thresholds and similar obstacles.

Before moving the device, remove the monitors and other additional devices.

Trolley version

<table>
<tr><th>Left side</th><th colspan="2">Top of device</th><th>Right side</th></tr>
<tr><td rowspan="4">– Maximum permissible weight of the accessories is 15 kg (33 lbs).
– A max. of 10 kg (22 lbs) may be attached in the rear top GCX rail at a distance of max. 40 cm (16") at the top position.
– The remaining weight must be attached with a distance of max. 10 cm (4").</td><td colspan="2">Maximum permissible weight of the accessories on the Fabius monitor housing is 18 kg (40 lbs).</td><td rowspan="4">– Maximum permissible weight of the accessories is 15 kg (33 lbs).
– A max. of 10 kg (22 lbs) may be attached in the rear top GCX rail at a distance of max. 40 cm (16") at the top position.
– The remaining weight must be attached with a distance of max. 10 cm (4").</td></tr>
<tr><td rowspan="3">  </td><td>A maximum of 10 kg (22 lbs) can be set on the optionally available Fabius pull-out writing tray.</td></tr>
<tr><td>The standard rail may be loaded with max. 5 kg (11 lbs)</td></tr>
<tr><td>The individual drawers in the trolley may be loaded with maximum 6.8 kg (15 lbs).</td></tr>
<tr><td colspan="2">On the rear of the device, a maximum of 35 kg (77 lbs) (gas cylinders, including holder and accessories) can be attached.</td></tr>
</table>

Wall-mounted version and ceiling-mounted version

<table>
<tr><th>Left side</th><th colspan="2">Top of device</th><th>Right side</th></tr>
<tr><td rowspan="4">– Maximum permissible weight of the accessories is 15 kg (33 lbs).
– A max. of 10 kg (22 lbs) may be attached in the rear top GCX rail at a distance of max. 40 cm (16") at the top position.
– The remaining weight must be attached with a distance of max. 10 cm (4").</td><td colspan="2">Maximum permissible weight of the accessories on the Fabius monitor housing is 10 kg (22 lbs).</td><td rowspan="4">– Maximum permissible weight of the accessories is 15 kg (33 lbs).
– A max. of 10 kg (22 lbs) may be attached in the rear top GCX rail at a distance of max. 40 cm (16") at the top position.
– The remaining weight must be attached with a distance of max. 10 cm (4").</td></tr>
<tr><td rowspan="2">  </td><td>A maximum of 10 kg (22 lbs) can be set on the optionally available Fabius pull-out writing tray.</td></tr>
<tr><td>The standard rail may be loaded with max. 5 kg (11 lbs)</td></tr>
<tr><td colspan="2">Other accessory parts must be fastened on wall rails if necessary.</td></tr>
</table>

To increase the tipping stability:

- Remove all monitors and other additional devices from the top shelf.
- Dismount any additional devices mounted to the swivel arms or the top of the device (e.g., patient monitors, data management systems, syringe pumps).
- Clear the writing tray and slide it completely into the device.
- Position the optional flexible arm for breathing bag close to the device.

Prepare additional components as described in the respective instructions for use.

Getting started

Daily checkout and pre-use checkout

After preparing the medical device, the daily checkout and the pre-use checkout must be performed according to the appendix to these instructions for use. This ensures that the medical device is ready for operation.

WARNING

Risk of device malfunction

Some safety systems are only checked during start-up.
- **A selftest should be performed once daily.**
- **Switch the Fabius on and off or press the softkey *Run System Test*.**

Switching on

Prerequisite: The device is prepared (see chapter "Cleaning, disinfection and sterilization" on page 161) and assembled ready for operation (see chapter "Assembly and preparation" on page 52).

To prevent condensation and resulting failures of electrical components, do not switch on the device after abrupt temperature changes for 1 to 2 hours (e.g., after storage in unheated rooms).

WARNING

Risk of explosion and fire

Do not set the device into operation if oxygen leakage is suspected in the medical device or its vicinity.

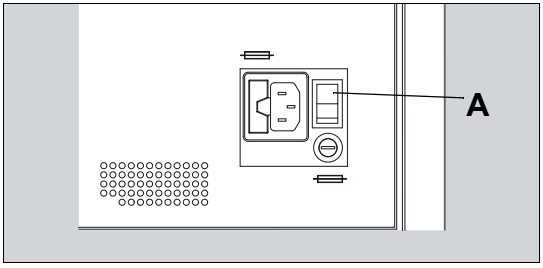
Stop oxygen supply and contact service personnel.

WARNING

Risk of accidental movement of the medical device

During operation the medical device can move accidentally.

Activate the castor brakes.



- Set On/Off switch (A) to the ⏺ position.

After switching on, the anesthesia workstation starts as follows:

– A system test is performed that checks various components. The entire results of the tests, as well as the test results for each component, are displayed on the screen.
– Passed: ***Pass***
– Failed: ***Fail***
– During the system test, 2 test tones are sounded to test the speakers. To hear these tones, do not stand any further than 4 meters (13 feet) from the device.
– After completion of the system test, the default settings for ventilation are loaded.

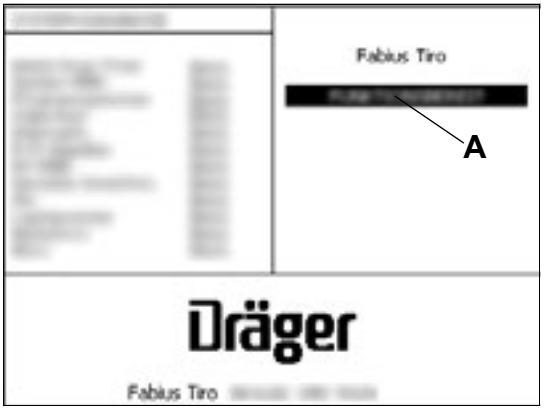
CAUTION

Malfunction of the device function

The user must check whether the test tones were actually sounded. The device only checks whether the speakers are connected. A complete loss of the ventilation function and monitoring function would possibly not be noticed if the speakers failed.

If no tone or only one tone is sounded, the device is only conditionally ready for operation. Contact DrägerService.

Checking the readiness for operation



At the end of the system test, one of 3 possible results (A) are displayed on the screen:

– ***FUNCTIONAL***
– ***CONDITIONALLY FUNCTIONAL***
– ***NON-FUNCTIONAL***

FUNCTIONAL

The device is ready for operation. After a short delay, the page ***Standby*** is displayed.

CONDITIONALLY FUNCTIONAL

A non-critical malfunction was found. The anesthesia workstation can be used.

– To open the page ***Standby***, press the rotary knob.
– Check if an alarm message is displayed.
– Contact DrägerService or the authorized local service partner.

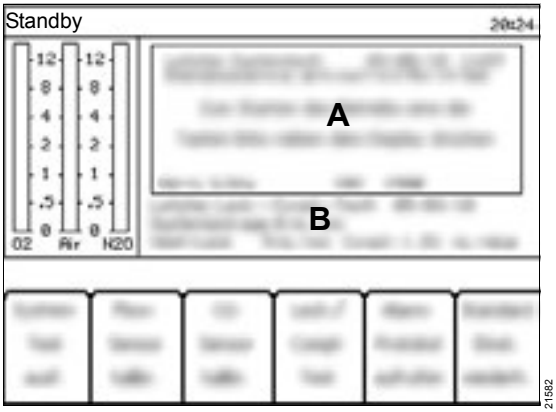
NON-FUNCTIONAL

A serious malfunction was found and the operation of the monitoring functions and ventilation functions are blocked.

– Do not use the device.
– Immediately contact DrägerService or the authorized local service partner.

Operation

Standby page after start-up



In ***Standby*** mode, different instructions (A) and information (B) are displayed on the screen.

A ***To start operation press one of the keyslocated to the left of the display***

B Last system test, last leakage/compliance test, system leakage, ventilator leakage, compliance

Setting the fresh-gas flow

The fresh-gas settings can be changed before a ventilation mode is selected.

- Set the fresh-gas flow.

S-ORC (Sensitive Oxygen Ratio Controller)

Fabius is equipped with a mechanical minimum O_2 delivery (S-ORC). This safety device prevents hypoxic gas mixtures if N_2O is selected as the carrier gas.

Starting at a flow of approx. 200 mL/min, the N_2O concentration in the fresh gas can be set to a value between 0% and 75%.

When a lack of O_2 is present, the S-ORC limits the N_2O concentration in the fresh gas so that the O_2 concentration will not fall below 23 Vol%.

S-ORC inhibits the N_2O flow under the following conditions:

– N_2O flow control valve is open, even though the O_2 flow control valve is closed.

– O_2 flow is below 0.2 L/min.

With an N_2O failure, O_2 can continue to be supplied. An alarm is not triggered. The float in the N_2O flow tube drops to zero.

S-ORC has no oxygen-specific monitoring function and offers no protection for the consequences of an accidental interchange of gases.

Therefore, the O_2 concentration must always be monitored.

CAUTION

Risk of inaccurate measured values

When the O_2 supply is again established after a failure of the O_2 supply, a supply pressure of at least 2.7 kPa x 100 must be maintained for at least 20 seconds. New failure of the O_2 supply will only be detected if the supply pressure is stable for at least 20 seconds.
Do not use any functions during this time that require O_2, for example:
– O_2 flush
– O_2 fresh-gas flow
– Endotracheal suction

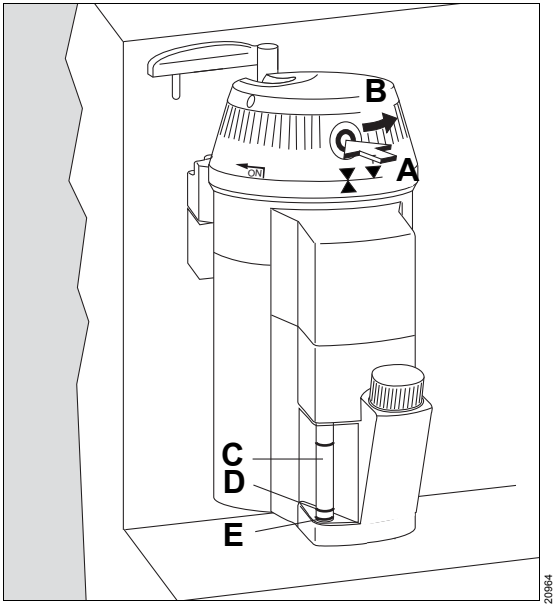
WARNING

Risk of material damage and risk to health

A vaporizer must never remain in operation without a fresh-gas flow. High concentrations of the anesthetic gas flow into the ventilation circuit and the ambient air. This can lead to material damage and contamination of the ambient air with anesthetic gases.

Never cut off the fresh-gas flow before the vaporizer is switched off.

Setting the anesthetic gas concentration



Prerequisite: The vaporizer is mounted in accordance with the instructions for use of the respective vaporizer.

WARNING

Risk of patient injury

When the vaporizer is in the control dial position T, has heated up due to high ambient temperature, and is then used, a high anesthetic gas concentration might be delivered.

After connecting the vaporizer to the anesthesia workstation, always turn the control dial of the vaporizer to position 0 and wait at least 15 seconds to enable a pressure equalization.

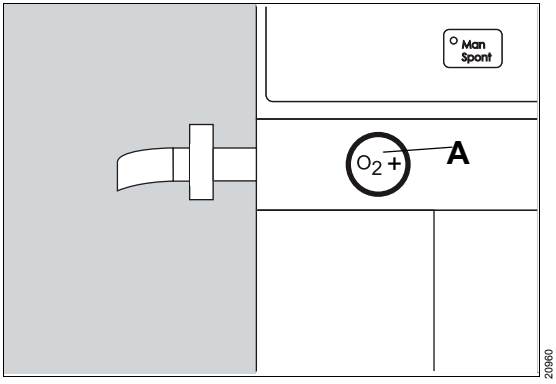
The following section describes the operation of Vapor 2000.

- Set the fresh-gas flow on the anesthesia workstation.

If the control dial is in position T:

1. Press the 0 key (A) and engage the control dial (B) to position 0. To ensure pressure equalization, wait at least 15 seconds.
2. Press the 0 key (A) and set the control dial (B) counterclockwise to the desired anesthetic gas concentration.
3. Check the filling level on the sight glass (C) regularly. The filling level must be between minimum and maximum.
4. When the refill mark (D) is reached, 250 mL (normal anesthetic agent bottle) can be refilled.
5. Fill the vaporizer at the latest when the minimum mark (E) is reached, refer to instructions for use of the respective vaporizer.

O2 flush



The O2 flush is used for flushing and quickly filling the breathing system and breathing bag with O2 while bypassing the vaporizer.

During this an unmetered flow of at least 35 L/min is given to the breathing system and the breathing bag.

- Press the O_2+ (A) key. O2 flows for as long as the key is held down.

Use of the O2 flush can increase airway pressure very quickly and abruptly change the gas concentration.

NOTE

In ***ManSpont*** mode, the pressure can increase quickly and thus trigger the APL valve.

Low-flow anesthesia

In low-flow anesthesia (flow ≤1.0 L/min), moisture naturally condenses from the patient's exhaled air in the hoses. To prevent water collection in the hoses, a water trap must be integrated in the ventilator hose.

For longer low-flow anesthesia, the additional use of water traps in the expiratory hose is recommended. When the filling height exceeds the maximum mark, empty the water trap.

WARNING

Risk due to the accumulation of acetone in the patient

Do not perform low-flow anesthesia on patients with ketoacidosis or patients under the influence of alcohol. The risk of accumulation of acetone in the patient increases in such cases.

CAUTION

Risk of patient injury

The use of minimum-flow or low-flow settings can lead to accumulation of metabolic by-products in the breathing system.

If minimum-flow or low-flow settings are used, flush the breathing system regularly with the O_2 flush.

CAUTION

Risk of patient injury

Unsuitable soda lime can result in disintegration products from the anesthetic gases.

Use suitable soda lime such as Drägersorb Free.

Nitrogen rinsing (as needed)

There is still air in the lungs of the patient and the breathing system during anesthesia introduction, which contains a fraction of approx. 77 % nitrogen. If the device is used for a low-flow anesthesia, press the O_2+ key. This removes the nitrogen.

Replacing the soda lime

Soda lime changes color if no more CO_2 can be absorbed. When 2/3 of the soda lime has changed color, the soda lime must be replaced.

Dräger recommends the use of Drägersorb 800 Plus or Drägersorb FREE.

Drägersorb 800 Plus and Drägersorb FREE change color from white to violet.

For instructions for replacing the CO_2 absorber, see chapter "Mounting the CO_2 absorber to the compact breathing system" on page 62.

WARNING

Risk due to soda lime drying out

The soda lime loses moisture. If the moisture falls below the minimum moisture, the following adverse reactions occur independent of the type of soda lime and inhalational anesthetic used: Decreased CO_2 absorption, increased generation of heat in the CO_2 absorber resulting in increased breathing gas temperature, formation of CO, absorption and/or degradation of the inhalational anesthetics.

- **Do not use unnecessarily high fresh-gas flows.**
- **Only use the supplemental O_2 delivery if necessary.**
- **Do not leave the flow control valves open unnecessarily long.**

CAUTION

Risk of chemical burns

Soda lime is caustic and is a strong irritant for eyes, skin, and airway. If soda lime has escaped, e g., from damage of the disposable CO_2 absorber:

- Do not inhale or swallow lime dust.
- Wear protective gloves and safety glasses or face protection.
- In case of contact with the eyes, immediately rinse with water thoroughly and immediately see a doctor.
- In case of skin contact, immediately wash the skin.

NOTE

Follow the respective instructions for use for Drägersorb 800 Plus or Drägersorb FREE.

Ventilation

The user is responsible for setting the gas delivery and ventilation according to the individual patient status. Patient status must be continually monitored for any potential changes.

WARNING

Risk of strangulation

Negligent placement of hoses, cables, and similar device components can endanger the patient.

Use particular caution when establishing connections to the patient.

Ventilation mode *ManSpont*

ManSpont (Manual/Spontaneous, manual ventilation/spontaneous breathing) is a non-automatic ventilation mode. However, ventilation monitoring and alarm monitoring are still active.

The selection between manual ventilation and spontaneous breathing is made on the APL valve. If the APL valve is in the ***Spont*** position, spontaneous breathing is enabled.

WARNING

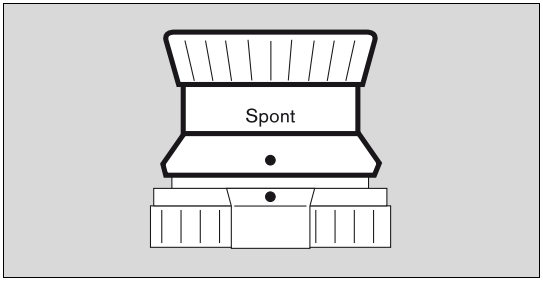
Risk of excessively high airway pressures

If the ventilator fails, the device switches into the *ManSpont* ventilation mode.

The APL valve should also be set to a pressure limitation value suitable for the patient when using automatic ventilation modes since in case of a ventilator failure the patient must be ventilated manually.

In the following examples and illustrations, the change from ***Volume Control*** mode to ***ManSpont*** mode is described:

Changing to spontaneous breathing

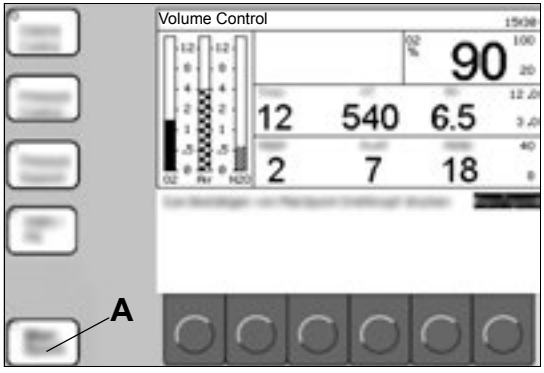


1 Turn the APL valve head counterclockwise to its final position stop.

The label ***Spont*** and both points are vertical to each other. The valve head lifts.

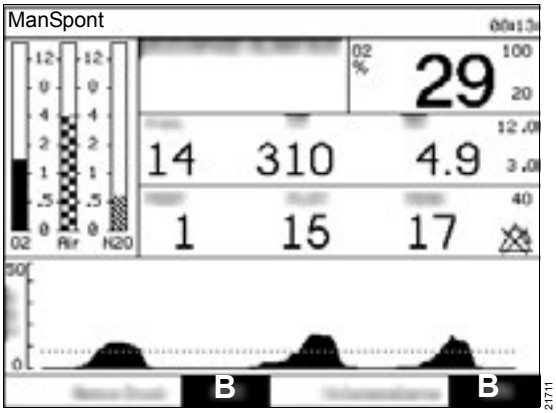
The pressure limitation is disabled and the valve is open for free spontaneous breathing.

2 Set suitable fresh-gas flow.



3 Press the ***ManSpont*** (A) key.

4 Confirm the new mode.



The following alarms can be activated or deactivated on the ***ManSpont*** screen with the ***ON*** / ***OFF*** key (B):

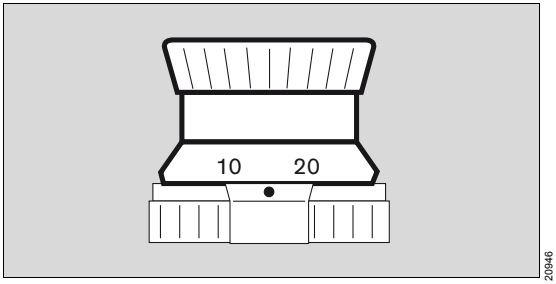
– ***Apnoea Pressure*** (see chapter "Pressure alarms in automatic ventilation modes" on page 122)

– ***Volume Alarms*** (see chapter "Volume alarms" on page 121)

Changing to manual ventilation

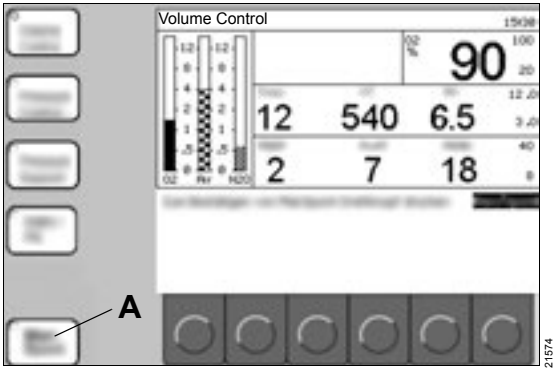
NOTE

In ***ManSpont*** mode, the apnea alarm time for triggering apnea volume alarms is extended from 15 seconds to 30 seconds (Caution category) and from 30 seconds to 60 seconds (Warning category).



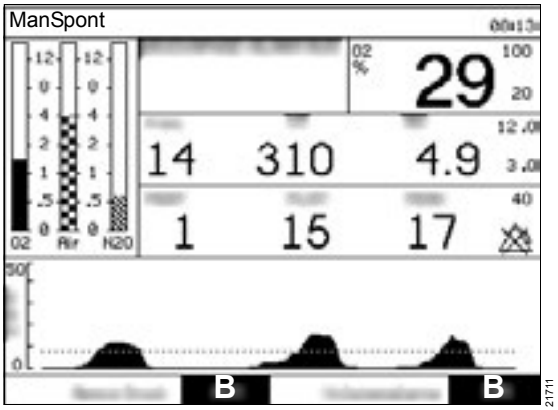
1 Set the APL valve head to the desired maximum airway pressure.

Settings between the grid marks are also possible.



2 Press the ***ManSpont*** (A) key.

3 Confirm the new mode.



The following alarms can be activated or deactivated in ***ManSpont*** mode with the ***ON***/***OFF*** key (B):

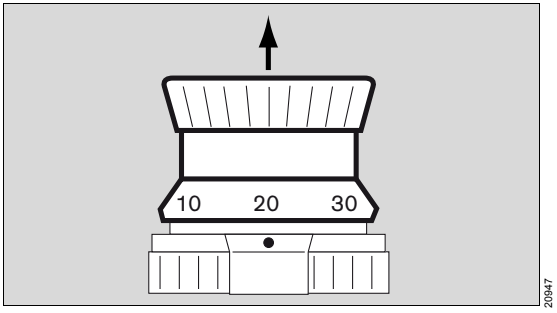
- ***Apnoea Pressure*** (see chapter "Pressure alarms in automatic ventilation modes" on page 122)
- ***Volume Alarms*** (see chapter "Volume alarms" on page 121)

4 To refill the breathing bag, press the O_2+ key.

5 Set suitable fresh-gas flow.

6 Start manual ventilation with the breathing bag. The pressure is limited to the value that is set on the APL valve.

Pressure release



In the ***ManSpont*** mode, lifting the valve head relieves pressure from the breathing system.

Ventilation mode *Volume Control*

Compensation of ventilator compliance

Ventilator compliance compensation is active in ***Volume Control*** mode so that the tidal volume administered to the patient (***VT***) corresponds to the tidal volume setting. The ventilator compliance is determined during the leakage test in ***Standby*** mode, see chapter "Leakage test" on page 128.

The breathing hoses used during the leakage test and compliance test must also be used during operation.

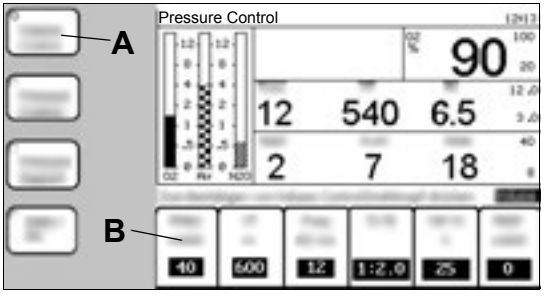
This guarantees an exact compliance compensation.

NOTE

If the ventilator works at its performance limit due to the volume control settings, Fabius cannot make the compliance compensation. If the performance limit of the ventilator is reached, it is not possible to increase the setting for tidal volume ***VT***.

Changing to *Volume Control* mode

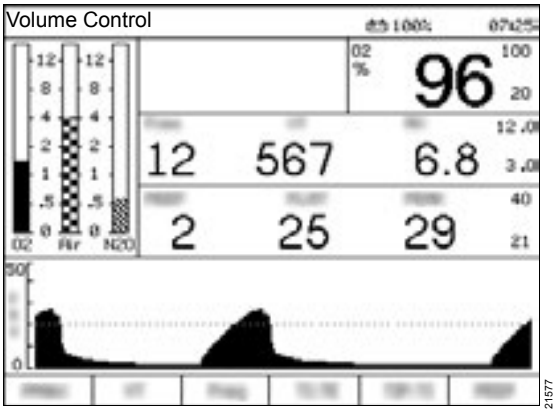
In the following examples and illustrations, the change from ***Pressure Control*** mode to ***Volume Control*** mode is described:



1 Press the ***Volume Control*** (A) key.

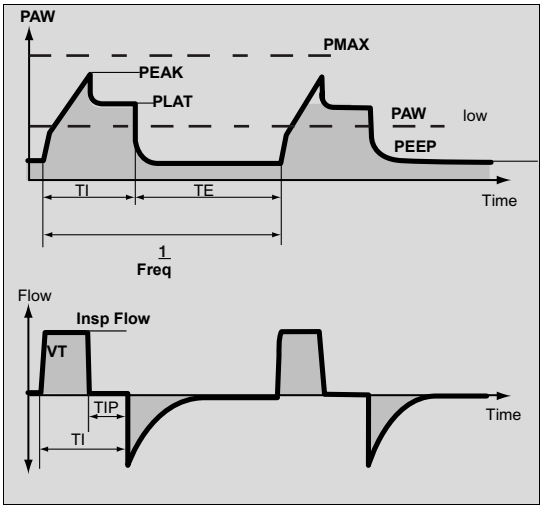
2 Adjust ventilation settings (B).

3 Confirm the new mode.



In the following table, all parameters (B) in ***Volume Control*** mode, together with the corresponding setting ranges and factory settings, are listed.

Parameter	Setting range	Factory setting
Pressure limitation ***PMAX*** [cmH2O] ([hPa])	15 to 70, min. ***PEEP*** +10	40
Tidal volume ***VT*** [mL]	20 to 1400	600
Respiratory rate ***Freq*** [bpm] ([1/min])	4 to 60	12
Inspiratory time:expiratory time***TI:TE***	4:1 to 1:4	1:2
Inspiratory pause time:inspiratory time ***TIP:TI*** [%]	0 to 50	10
PEEP [cmH2O] ([hPa])	0 to 20	0



For every mandatory breath, the patient receives the set tidal volume (***VT***) with a constant inspiratory flow (***Insp Flow***). The set tidal volume is based on a defined respiratory rate (***Freq***) and a defined ratio of inspiratory time to expiratory time (***TI:TE***).

The inspiratory flow (***Insp Flow***) results from the tidal volume (***VT***) and the ratio of inspiratory pause to inspiratory time (***TIP:TI***).

If ***TIP:TI*** is set to 0, the tidal volume ***VT***) is supplied with the lowest inspiratory flow (***Insp Flow***) that is possible at the corresponding respiratory rate (***Freq***). In addition, a positive end-expiratory pressure (***PEEP***) can be set.

To prevent too high pressure, the alarm limit ***PMAX*** can be set corresponding to the physiological condition of the patient.

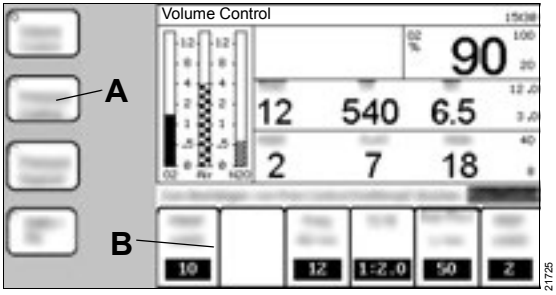
The lower alarm limit of the airway pressure (***PAW low***) is used for the airway pressure monitoring to detect apnea (disconnection) and continuous pressure.

If the pressure waveform does not cross the pressure threshold either from above or below, an alarm is sounded.

Ventilation mode *Pressure Control* (optional)

Changing to *Pressure Control* mode

In the following examples and illustrations, the change from ***Volume Control*** mode to ***Pressure Control*** mode is described:

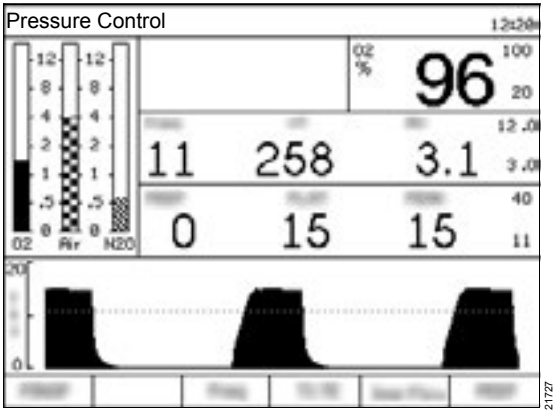


1 Press the ***Pressure Control*** (A) key.

2 Adjust ventilation settings (B).

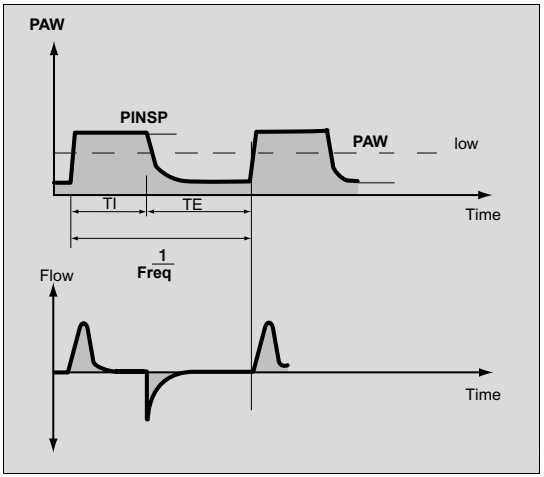
3 Confirm the new mode.

Due to the influence of compliance and resistance, the set value for ***Freq Min*** in ***Pressure Control*** mode might not exactly be applied.



In the following table, all parameters (B) in ***Pressure Control*** mode, together with the corresponding setting ranges and factory settings, are listed.

Parameter	Setting range	Factory setting
Inspiratory pressure ***PINSP*** [cmH2O] ([hPa])	5 to 65, min. ***PEEP*** +5	15
Respiratory rate ***Freq*** [bpm] ([1/min])	4 to 60	12
Inspiratory time:expiratory time***TI:TE***	4:1 to 1:4	1:2
Inspiratory flow***Insp Flow*** [L/min]	10 to 75	30
PEEP [cmH2O] ([hPa])	0 to 20	0



A tidal volume is supplied based on a defined respiratory rate (***Freq***) and a defined ratio of inspiratory time to expiratory time (***TI:TE***).

This tidal volume is dependent on the set inspiratory pressure (***PINSP***) and from the patient compliance. The parameter ***Insp Flow*** is used to set the increase of the slope of the pressure waveform. In addition, a positive end-expiratory pressure (***PEEP***) can be set.

The lower alarm limit of the airway pressure (***PAW low***) is used for the airway pressure monitoring to detect apnea (disconnection) and continuous pressure.

If the pressure waveform does not cross the pressure threshold either from above or below, an alarm is sounded.

Ventilation mode *Pressure Support* (optional)

Pressure Support (Pressure Support) is a pressure-supported ventilation mode for patients with spontaneous breathing. Patients who make no inspiratory effort must not be ventilated with ***Pressure Support***.

The ventilation mode ***Pressure Support*** is triggered by the inspiratory effort of the patient. Most anesthetic agents cause a reduced reaction of the patient to carbon dioxide and hypoxemia. Therefore ventilation modes, which are triggered by patients, do not ensure adequate ventilation in these conditions. In addition, the use of muscle relaxants negatively influences the triggering by the patient.

In ***Pressure Support*** ventilation mode, the apnea ventilation function is available, which can ensure a minimum ventilation. To activate apnea ventilation, for the setting ***Freq Min*** another setting must be selected than ***OFF***. If the detected spontaneous respiratory rate of the patient drops under the set value for ***Freq Min***, a mechanical breath is applied. Apnea ventilation is not intended to be a primary ventilation mode.

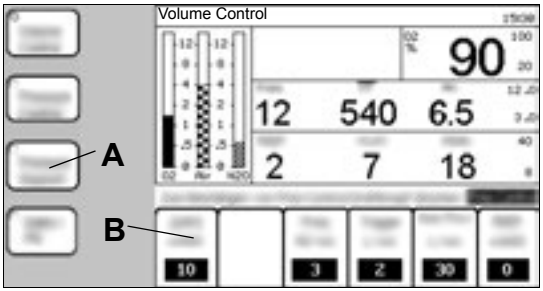
For apnea ventilation, Fabius uses the settings for the following parameters:

– ***ΔPPS***
– ***Freq Min***
– ***Insp Flow***
– ***PEEP***

If 2 successive mechanical breaths occur with apnea ventilation, the alarm message ***APNOEA VENTILATION !!*** is displayed in the alarm message field. The alarm message is deleted as soon as a spontaneous breath is detected.

Changing to *Pressure Support* mode

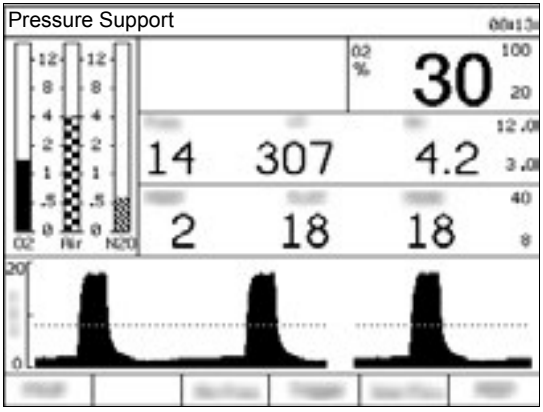
In the following examples and illustrations, the change from ***Volume Control*** mode to ***Pressure Support*** mode is described:



1 Press the ***Pressure Support*** (A) key.

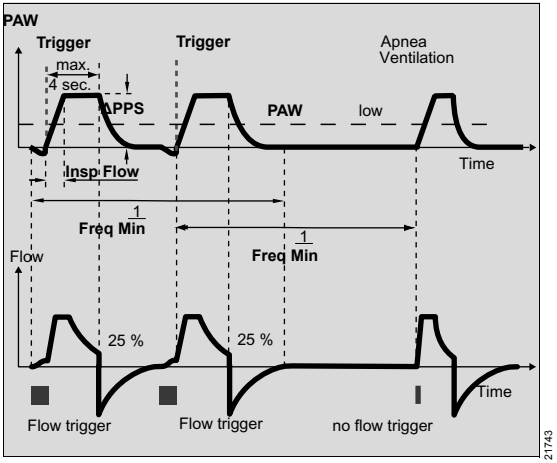
2 Adjust ventilation settings (B).

3 Confirm the new mode.



In the following table, all parameters (B) in ***Pressure Support*** mode, together with the corresponding setting ranges and factory settings, are listed.

Parameter	Setting range	Factory setting
Support pressure ***ΔPPS*** [cmH2O] ([hPa])	3 to 20, ***OFF***	10
Minimum respiratory rate for apnea ventilation ***Freq Min*** [bpm] ([1/min])	3 to 20, ***OFF***	3
Trigger sensitivity ***Trigger*** [L/min]	2 to 15	2
Inspiratory flow ***Insp Flow*** [L/min]	10 to 85	30
PEEP [cmH2O] ([hPa])	0 to 20	0



If the inspiratory flow (***Insp Flow***) during inspiratory effort is greater than the set trigger flow (***Trigger***), the device supports the patient with the setting ***ΔPPS***.

The set inspiratory flow (***Insp Flow***) defines how fast the ***ΔPPS*** pressure is reached. When 25 % of the maximum inspiratory flow (***Insp Flow***) is reached (or after maximum 4 seconds), the inspiration is automatically ended. The value ***Freq Min*** (e.g., 3 bpm (1/min)) defines a safety period (safety period = 1/***Freq Min***, e.g., 20 seconds). If no inspiratory effort is detected and the safety period has elapsed, the device generates a pressure-controlled breath with ***PINSP=ΔPPS***.

The lower alarm limit of the airway pressure ***PAW low*** is used for the airway pressure monitoring to detect apnea (disconnection) and continuous pressure.

If the pressure waveform does not cross the pressure threshold either from above or below, an alarm is sounded.

Ventilation mode *SIMV/PS* (optional)

The ventilation mode ***SIMV*** (synchronized intermittent mandatory ventilation) is a mixture of ventilation and spontaneous breathing. In ventilation ***SIMV*** mode, the patient can breathe spontaneously. The ventilation is done synchronously to the inspiratory effort of the patient.

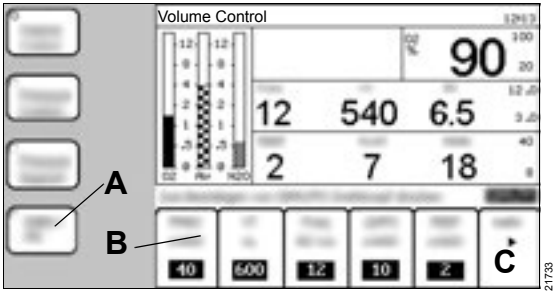
The mandatory breaths are defined based on the following parameters:

– ***VT***
– ***Freq***
– ***TINSP***
– ***TIP:TI***
– ***PEEP***

To support the inspiratory effort of the patient in ventilation ***SIMV*** mode, pressure support ***ΔPPS*** can be switched on. The setting of ***ΔPPS*** to another value than ***OFF*** activates the mode ***Pressure Support***, see chapter "Ventilation mode Pressure Support (optional)" on page 99.

Changing to *SIMV* mode

In the following examples and illustrations, the change from ***Volume Control*** mode to ***SIMV/PS*** mode is described:

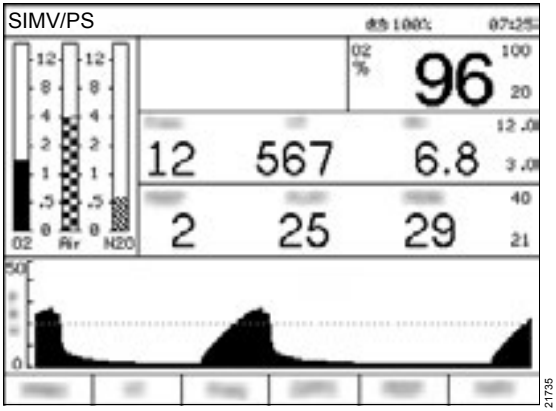


1 Press the ***SIMV/PS*** (A) key.

2 Adjust ventilation settings (B).

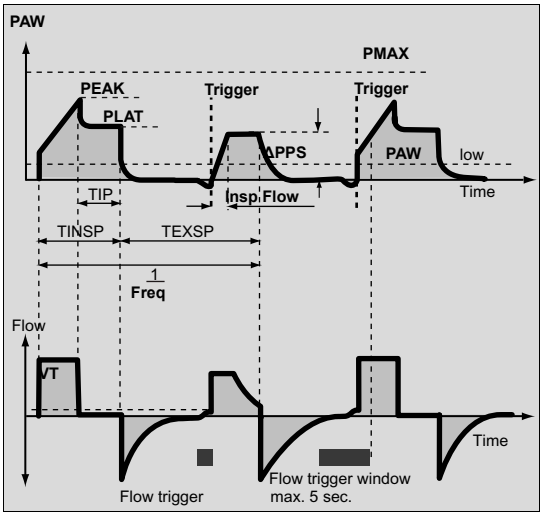
- To set the following additional parameters, press the ***MORE*** (C) key:
  – ***Trigger***
  – ***Insp Flow***
  – ***TINSP***
  – ***TIP:TI***

3 Confirm the new mode.



In the following table, all parameters (B) in ***SIMV/PS*** mode, together with the corresponding setting ranges and factory settings, are listed.

Parameter	Setting range	Factory setting
Pressure limitation ***PMAX*** [cmH2O] ([hPa])	15 to 70, min. ***PEEP*** +10 and >***ΔPPS*** +***PEEP***	40
Tidal volume ***VT*** [mL]	20 to 1100	600
Respiratory rate ***Freq*** [bpm] ([1/min])	4 to 60	12
Pressure support ***ΔPPS*** [cmH2O] ([hPa])	3 to 20 ***OFF***	10
PEEP [cmH2O] ([hPa])	0 to 20	0
Trigger sensitivity ***Trigger*** [L/min]	2 to 15	2
Inspiratory flow-***Insp Flow*** [L/min]	10 to 85	30
Inspiratory time ***TINSP*** [seconds]	0.3 to 4.0	1.7
Inspiratory pause time:inspiratory time ***TIP:TI*** [%]	0 to 50	10

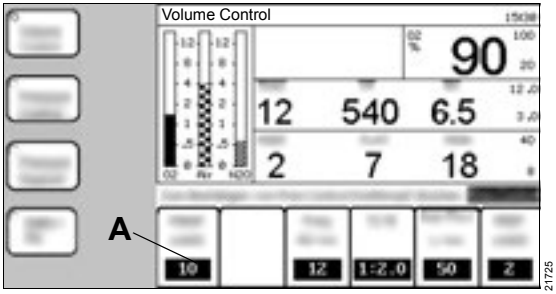


The respiratory rate ***Freq*** defines the time between the individual volume-controlled breaths. The synchronization of the mechanical breaths is done with a trigger sensitivity (***Trigger***) that is activated a specific time before administering a new mechanical breath: 5 s for respiratory rates (***Freq***) below 12 bpm (1/min). For higher respiratory rates, the synchronization is done immediately after the preceding expiration. Between these mandatory breaths, the patient can breathe spontaneously. Mandatory breaths are synchronized with the spontaneous breaths of the patient. These spontaneous breaths can be supported with ***ΔPPS***.

The lower alarm limit of the airway pressure ***PAW low*** is used for the airway pressure monitoring to detect apnea (disconnection) and continuous pressure.

If the pressure waveform does not cross the pressure threshold either from above or below, an alarm is sounded.

Adopting ventilation settings during mode change



The ventilation settings for the new ventilation mode are automatically derived from the settings of the previous ventilation mode. The corresponding settings (A) in the new ventilation mode are highlighted.

The settings for ***Freq***, ***TI:TE*** and ***PEEP*** are adopted directly from the settings of the previous ventilation mode if necessary.

When changing from ***Volume Control*** to ***Pressure Control***:

– ***PINSP*** is set to the plateau pressure (***PLAT***) that occurred in ***Volume Control***.

– ***Insp Flow*** is set to the last used value or the factory setting.

When changing from ***Pressure Support*** to ***Pressure Control***:

– ***Insp Flow*** is set to the last used value or the factory setting.

When changing from ***Pressure Control*** to ***Volume Control***:

– ***VT*** is set to the value that results from the division of the last minute volume (***MV***) by the respiratory rate (***Freq***).

– ***TIP:TI*** is set to the last used value or the factory setting.

– ***PMAX*** is set to a value that lies 10 cmH_2O (hPa) above the plateau pressure (***PLAT***) that occurred in ***Pressure Control***.

When changing from ***Volume Control*** to ***Pressure Support***:

– ***Insp Flow*** is set to the last used value or the factory setting.

– ***ΔPPS*** is set to the last used value or the factory setting.

– ***Trigger*** is set to the last used value or the factory setting.

When changing from ***Pressure Control*** to ***Pressure Support***:

– ***Insp Flow*** is set to the last used value or the factory setting.

– ***ΔPPS*** is set to the last used value or the factory setting.

– ***Trigger*** is set to the last used value or the factory setting.

When changing from ***Volume Control*** to ***SIMV/PS***

– ***PMAX*** and ***PEEP*** are automatically adopted for the new ventilation mode from the previous mode.

When changing from ***Pressure Support*** to ***SIMV/PS***:

– ***ΔPPS*** , ***Insp Flow*** , ***Trigger***, and ***PEEP*** are automatically adopted for the new ventilation mode from the previous mode.

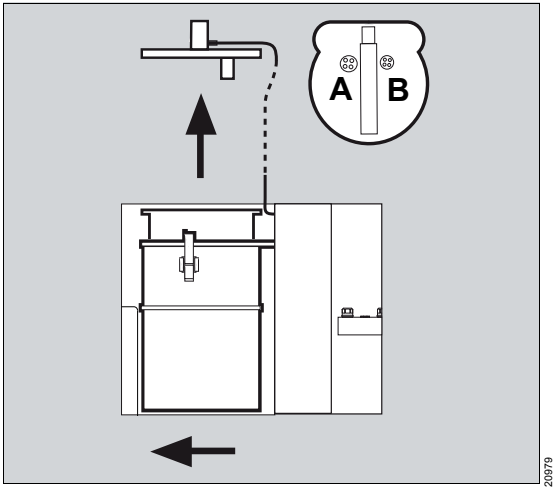
When changing from ***SIMV/PS*** with ***Pressure Support*** to ***Pressure Support***:

– ***ΔPPS*** and ***Insp Flow*** are automatically adopted for the new ventilation mode from the previous mode.

When changing from ***SIMV/PS*** to ***Pressure Support***:

– ***Trigger*** and ***PEEP*** are automatically adopted for the new ventilation mode from the previous mode.

Safety functions of the ventilator



– Overpressure safety valve (A)
– Underpressure safety valve (B)
– Pressure sensor in the ventilator chamber

Behavior with too low fresh-gas supply

For very low fresh-gas flow or an extremely large leakage in the breathing system circuit, there can be insufficient fresh gas. This is detected by the gradual emptying of the breathing bag.

NOTE

To remedy this, the user must take actions, e.g., increasing the fresh-gas flow.

Behavior of Fabius if the user does not take any action

– Breathing bag empties completely little by little.
– After 2 more mechanical breaths, the ***FRESH GAS LOW !!*** alarm and other alarms are triggered.
– Since the ventilator does not contain sufficient fresh gas, the reserve volume is absorbed.

As long as there is insufficient fresh gas, the safety valve (B) for ambient air remains open during expiration.

CAUTION

Risk of patient recovering consciousness

If the gas supply fails completely, further operation of the anesthesia machine takes place with gas supply with ambient air. Anesthetic agents are no longer delivered and the inspiratory anesthetic gas concentration in the breathing gas decreases.

Monitor the gas mixture carefully and use intravenous anesthetic agents if need be.

This allows for emergency ventilation with limited ***VT*** even with extremely low fresh-gas supply. There will be no sudden switch-off of the ventilator.

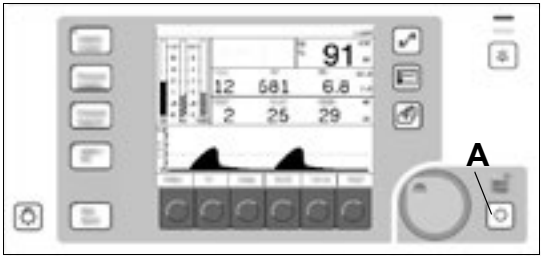
Patient change

WARNING

Risk due to incorrect settings

For anesthesia machines within the same care area, different standard alarm limits or ventilation settings might be configured. The user must observe the following points:

- **Make sure that the values set for new patients are appropriate.**
- **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 start settings for alarms and alarm settings each time the ventilation mode is changed.**



Carry out the following steps when changing patients:

1 Press the ⏻ key (A) and confirm.
   - Ventilation monitoring and alarm monitoring are switched off.
   - The ventilator stops.
   - Fresh-gas monitoring is continued.
   - The current settings remain the same.
   - The ***Standby*** screen is active.
   - Default settings are activated.

2 Press the ***Restore Site Defaults*** key, see chapter "Restoring the default settings" on page 131.

3 Check all components. For details on the test steps, see chapter "Form for daily checkout and pre-use checkout" on page 210.

4 If necessary, perform the leakage test, see chapter "Leakage test" on page 128.

   Dräger recommends performing the leakage test in the following cases:
   - When the soda lime is replaced.
   - When the breathing hoses are replaced.
   - When a vaporizer is replaced or filled.

WARNING

Risk of patient injury

During the leakage test, the breathing system is pressurized.

To avoid patient injuries, disconnect the patient before the leakage test.

5 Set the ventilation mode and continue, see chapter "Ventilation" on page 92.

Using the external fresh-gas outlet as a common gas outlet (optional)

WARNING

Insufficient gas supply to the patient

Non-rebreathing systems are only intended for manual ventilation or spontaneous breathing and must only be connected to the external fresh-gas outlet.

When using a non-rebreathing system, ensure an adequate gas monitoring.

WARNING

Risk of misinterpretation of measured values

The values for O_2, pressure, and volume displayed on Fabius do not correspond to the values for the patient connected to external fresh-gas outlet as they are based on measurements taken at the compact breathing system.

When using the external fresh-gas outlet, change into the *Standby* mode.

WARNING

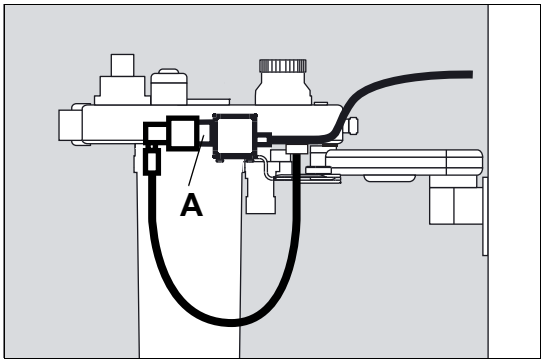
Risk of faulty gas delivery

O_2 and CO_2 and any anesthetic gases must also be monitored for non-rebreathing systems.

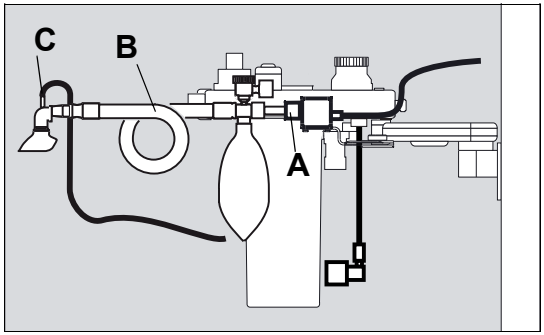
The sample line must be connected with the connector of the non-rebreathing system and the connector of the gas analyzer (e.g., Scio, Vamos).

Preparation

Example: Bain non-rebreathing system

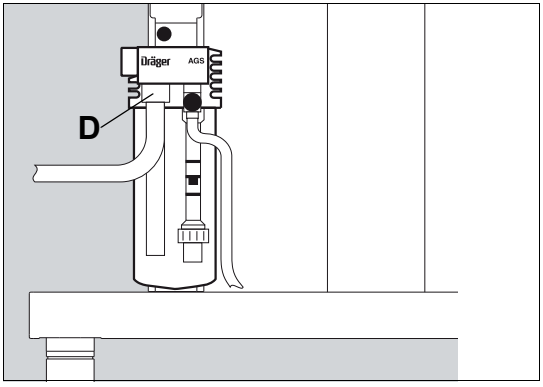


1 Remove fresh-gas hose from the external fresh-gas outlet (A).



2 Connect the non-rebreathing system (B) to the external fresh-gas outlet (A).

3 Screw on the sample line (C) to the Luer Lock connector of the ventilation mask or of the breathing system filter and to the water trap on the patient-gas measurement module.



4 If necessary, connect the anesthetic gas scavenging hose of the non-rebreathing system to the second connection (D) of the anesthetic gas receiving system.

Observe the instructions for use of the non-rebreathing system and the anesthetic gas receiving system.

Operation

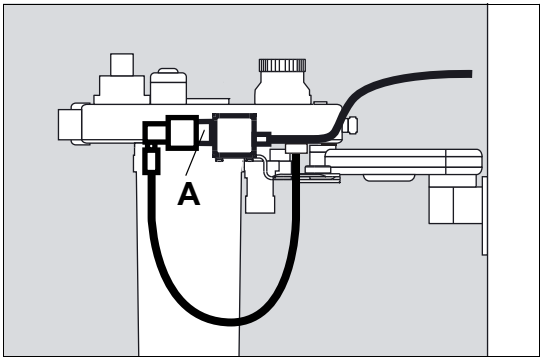
1 Change to ***Standby*** mode.

2 Set the fresh-gas flow.

To prevent rebreathing, the fresh-gas supply must be at least double the minute volume.

3 Operate the non-rebreathing system according to the corresponding instructions for use.

Ending operation



1 Close all flow control valves on the device.

2 Disconnect the non-rebreathing system from the external fresh-gas outlet.

3 Connect the fresh-gas hose to the external fresh-gas outlet (A).

4 Screw the sample line back to the Y-piece on the breathing circuit.

Using the external fresh-gas outlet with an auxiliary switch (optional)

WARNING

Insufficient gas supply to the patient

Non-rebreathing systems are only intended for manual ventilation or spontaneous breathing and must only be connected to the external fresh-gas outlet.

When using a non-rebreathing system, ensure an adequate gas monitoring.

WARNING

Risk of misinterpretation of measured values

The values for O_2, pressure, and volume displayed on Fabius do not correspond to the values for the patient connected to external fresh-gas outlet as they are based on measurements taken at the compact breathing system.

When using the external fresh-gas outlet, change into the *Standby* mode.

WARNING

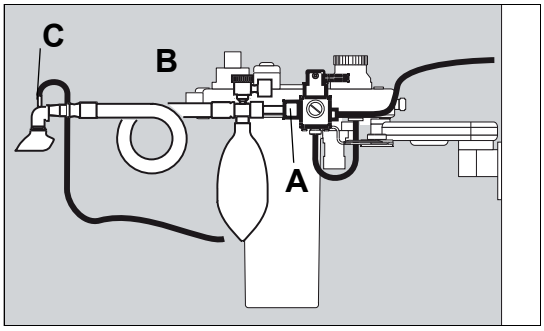
Risk of faulty gas delivery

O_2 and CO_2 and any anesthetic gases must also be monitored for non-rebreathing systems.

The sample line must be connected with the connector of the non-rebreathing system and the connector of the gas analyzer (e.g., Scio, Vamos).

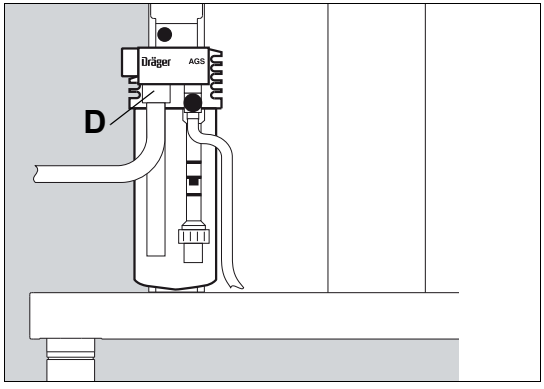
Preparation

Example: Bain non-rebreathing system



1 Connect the non-rebreathing system (B) to the external fresh-gas outlet (A).

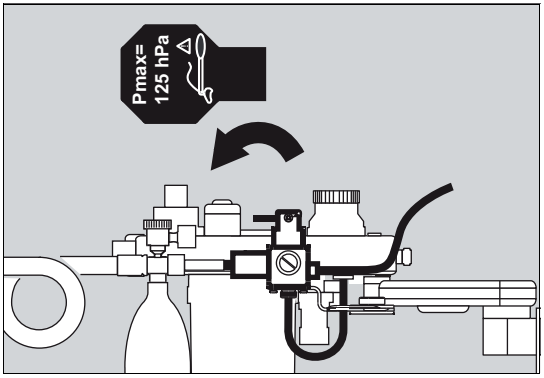
2 Screw on the sample line (C) to the Luer Lock connector of the ventilation mask or of the breathing system filter and to the water trap on the gas monitor.



3 If necessary, connect the non-rebreathing system scavenging hose to the second connection (D) of the anesthetic gas receiving system.

Observe the instructions for use of the non-rebreathing system and the anesthetic gas receiving system.

Operation with non-rebreathing system



Diverting the fresh-gas flow to the non-rebreathing system:

1 Place the switch lever to  .

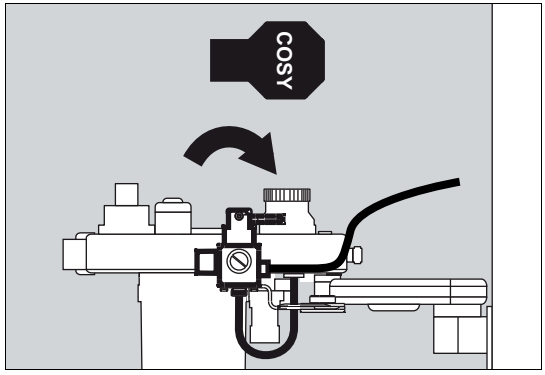
The lever points in the direction of the non-rebreathing system.

2 Set the fresh-gas flow.

To prevent rebreathing, the fresh-gas supply must be at least double the minute volume.

3 Operate the non-rebreathing system according to the corresponding instructions for use.

Operation with the compact breathing system (COSY)



Diverting the fresh-gas flow to the compact breathing system:

1 Place the switch lever to **COSY**.

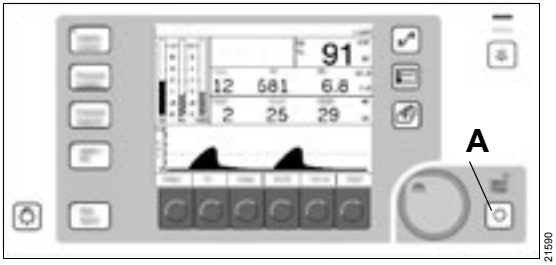
The lever points in the direction of the fresh-gas inlet.

Ending operation

1 Close all flow control valves on the device.

2 Screw the sample line back to the Y-piece on the breathing circuit.

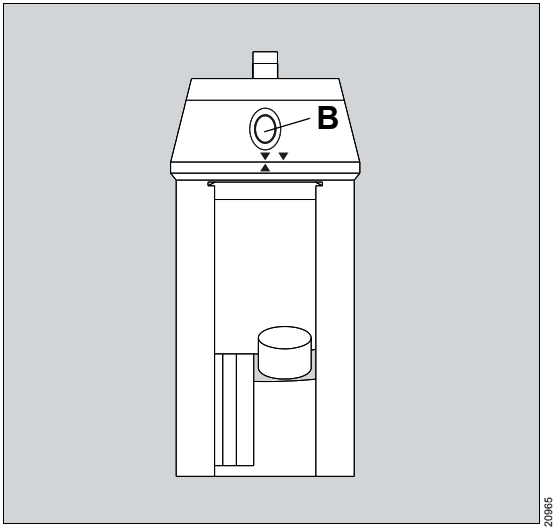
Ending operation



21590

1 Press the ⏻ button (A) and confirm.

Ventilation monitoring and alarm monitoring are switched off. The ventilator stops.



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2 Set the control dial (B) of the vaporizer until it engages on ***0***.

WARNING

Risk of material damage and risk to health

A vaporizer must never remain in operation without a fresh-gas flow. High concentrations of the anesthetic gas flow into the ventilation circuit and the ambient air. This can lead to material damage and contamination of the ambient air with anesthetic gases.

Never cut off the fresh-gas flow before the vaporizer is switched off.

3 Close the flow control valves.

Power-saving mode is activated after 2.5 minutes.

4 Close the cylinder valves.

NOTE

Leave Fabius connected to the mains power supply so that the battery is not discharged

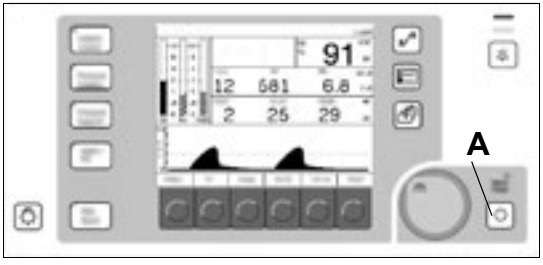
Preparing for storage or transport

WARNING

Risk of tipping over during transport

The medical device may tip over if handled incorrectly. Observe the following points when transporting medical devices:

- **The medical device may only be moved by people who have the physical ability to do so.**
- **To improve the maneuverability, transport the device with 2 persons.**
- **When transporting over inclines, around corners, or over thresholds (e.g., through doors or in elevators), make sure that the medical device does not bump against anything.**
- **Remove any devices mounted to the holding arms or the top of the device.**
- **Clear the writing tray and fold it down completely or slide it into the device.**
- **Do not pull the medical device over hoses, cables, or other obstacles lying on the floor.**
- **Do not activate the brake while the medical device is being moved.**
- **Always use the handles on the device to push or pull it.**



1 Press the ⏻ key (A) and confirm.

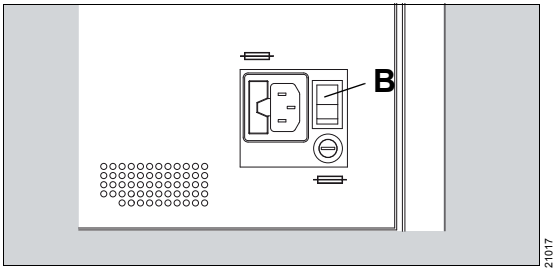
Monitoring and alarm monitoring are switched off. The ventilator stops.

2 Set the control dial (B) of the vaporizer until it engages on **0**.

3 Close the flow control valves.

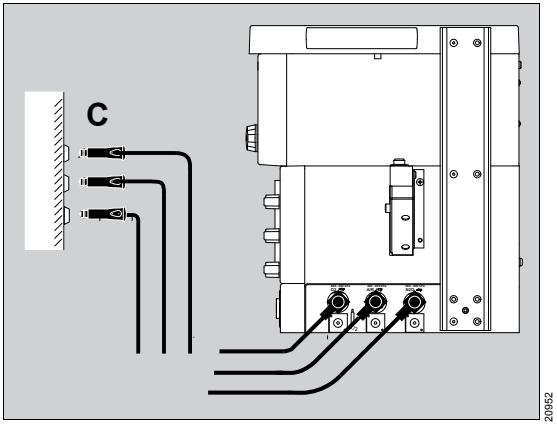
4 Close the cylinder valves of the gas cylinders.

5 Pull off the O_2 sensor from the inspiratory valve and expose to the ambient air.



6 Switch off Fabius with the On/Off switch (B) on the rear and pull out the plug.

7 Remove hoses of the anesthetic gas receiving system.



8 Remove central supply hoses (C).

9 To bring the entire system to normal pressure, press the O_2+ key.

Alarms

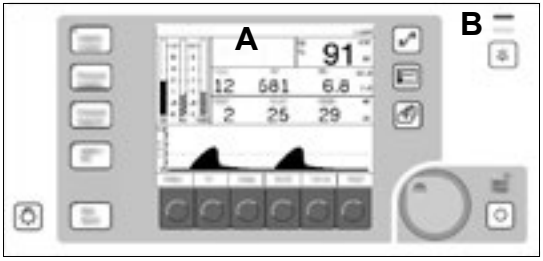
Alarm signaling

Alarms are signaled optically and acoustically.

Display of alarms

In the event of an alarm, the system displays the relevant alarm message in the alarm message field (A).

An LED indicator (B) lights up.



Acoustic signal

An alarm tone or alarm tone sequence sounds.

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 key is pressed.

Alarm	Display
Warning	– A warning message with 3 exclamation points (!!!) is displayed in the alarm message field (A). – The red LED (B) flashes, accompanied by a repeating alarm tone sequence: E-E-E--E-Bb-----E-E-E--E-Bb – The alarm tone sequence (2x5 alarm tones) sounds every 10 seconds.
Caution	– A message of caution category with 2 exclamation points (!!) is displayed in the alarm message field (A). – The yellow LED (B) flashes, accompanied by a repeating alarm tone sequence of 3 alarm tones: G-G-between G# and A
Note	– A notice with 1 exclamation point (!) is displayed in the alarm message field (A). – The yellow LED lights continuously, accompanied by a singe alarm tone sequence of 2 alarm tones: E-E" – with internal priority ≥6: alarm tone sequence of 2 tones – with internal priority <6: no tone

Alarm priorities

Fabius assigns the appropriate priority to each alarm.

The background color of the alarm message field indicates the priority of the active alarm.

The alarm messages are only displayed on colored background if the option "Color display" is activated.

Color	**Priority of the alarm message**		**Required action**	
Red	Warning	High-priority alarm	!!!	Immediate action is necessary in order to avert imminent danger.
Yellow	Caution	Medium-priority alarm	!!	Fast action is necessary in order to avert a danger.
	Note	Low-priority alarm	!	Attention is necessary, but a delayed response is sufficient.

The alarm messages are sorted according to these priorities and displayed corresponding to the internal priority system. Priority 31 has the highest and priority 1 the lowest priority. The priority numbers are listed in the table in chapter "Alarm – Cause – Remedy" on page 152.

There can be a maximum of 4 alarm messages* displayed at the same time in a list. Alarm messages with higher priority are displayed before alarm messages with lower priority. Alarm messages with low priority are only displayed if the cause for a high-priority alarm is remedied.

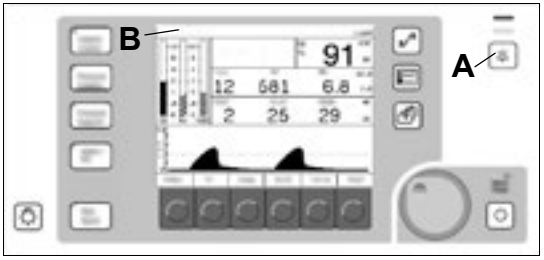
* optional 3 alarm messages for Japan and China

Example for sounding the alarm tone when several alarms are present

Priority of the existing alarm	Priority of the new alarm	Reaction from Fabius
(!!!) WARNING	(!!!) WARNING	– Alarm tone sequence starts from the beginning.
(!!!) WARNING	(!!) CAUTION	– Alarm tone sequence for the existing alarm is not interrupted. – No acoustic alarm signal for the new alarm
(!!) CAUTION	(!!) CAUTION	– Alarm tone sequence starts from the beginning.
(!!) CAUTION	(!!!) WARNING	– Alarm tone sequence for the new alarm is started.

Suppressing the alarm tone

The alarm tone can be suppressed for a maximum of 2 minutes.



- Press the (A) key.

  The LED in the key (A) lights up.

In the status bar (B), the symbol and the remaining time for the alarm tone suppression are displayed.

During the alarm tone suppression, only the new alarms are acoustically signaled whose alarm priority or internal priority number is higher than the suppressed alarm, see chapter "Alarm – Cause – Remedy" on page 152.

Reactivating the suppressed alarm tone

- Press the (A) key again.

  The LED in the key (A) goes out.

Adjusting the alarm limits

If an alarm is triggered due to a value falling below or exceeding the alarm limit, it might be necessary to adjust the standard alarm limits. More information for setting the alarm limits can be found in chapter "Changing the alarm limits" on page 134.

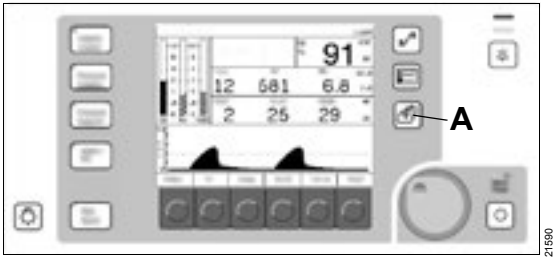
Setting the alarm limits in current ventilation mode:

- Press the key.

  More information can be found in chapter "Monitoring" on page 116.

Monitoring

Main screen



- Press the (A) key.

The current dialog window changes to the main screen.

The following information is displayed on the screen:

– Current alarm messages
– Data of the O_2 monitoring
– Data of the airway pressure monitoring
– Data of the breathing volume monitoring

O_2 monitoring

The inspiratory oxygen concentration is measured with a dual galvanic sensor, which is located in the cover of the inspiratory valve, see chapter "Compact breathing system COSY (top view)" on page 21.

CAUTION

Risk of inaccurate measured values

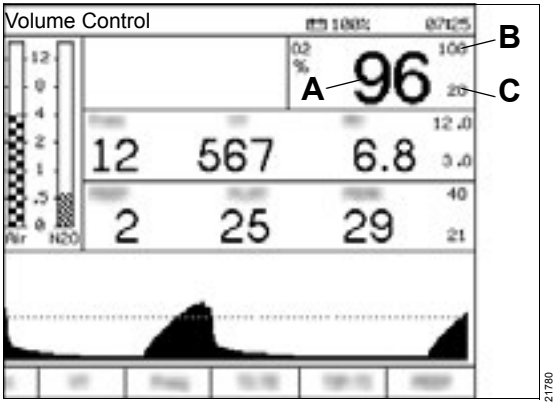
If the O_2 sensor is removed, this can lead to leaks in the breathing system.

When the O_2 sensor is replaced or removed, it must be recalibrated.

NOTE

If the anesthesia workstation is not used, remove the O_2 sensor from the cover of the inspiratory valve and insert the sealing plug provided.

Parameter field for O_2 monitoring



The following information is displayed in the parameter field for O_2 monitoring:

A Numerical value for the inspiratory O_2 concentration in percent (%) in the range from 10 % to 100 %

B Upper alarm limit for the O_2 concentration in (%)

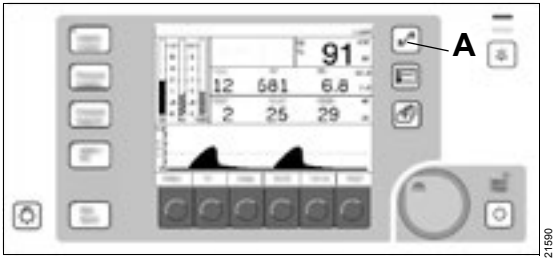
C Lower alarm limit for the O_2 concentration in (%)

Setting the O_2 alarm limits

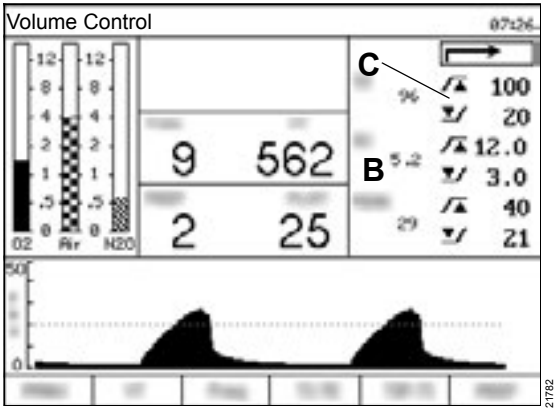
The standard alarm limits configured for the ventilation mode can be used unchanged, see chapter "Restoring the factory settings" on page 135.

or

The alarm limits can be set individually for the current case:



1 Press the (A) key.



The dialog window with the alarm limits (B) opens.

2 Adjust the upper and lower alarm limit values of the O_2 concentration (C), see setting ranges of alarm parameters in chapter "Changing the alarm limits" on page 134.

3 Confirm new values.

Calibrating the O_2 sensor

The O_2 sensor must be exposed to the ambient air during the entire calibration. The calibration of the O_2 sensor is done in the scope of the daily checkout of the readiness for operation of Fabius.

The O_2 sensor can be calibrated in the following ventilation modes:

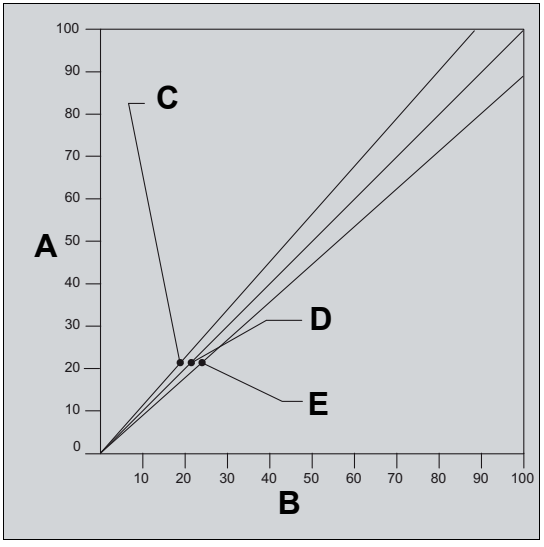
– In ***Standby*** mode, see chapter "Calibrating the O_2 sensor" on page 127.

– During the ventilation (in all available ventilation modes), see chapter "Calibrating the O_2 sensor" on page 141

Consequences of incorrect O_2 calibration

If the O_2 sensor is not correctly calibrated, it can lead to faulty measurements. With an air mixture with too high or too low O_2 concentration, Fabius does not perform a calibration completely. However, if the deviating concentration is within defined limits, Fabius completes the calibration even with non-optimal conditions. This can have the consequence that the displayed, measured sensor values indicate an O_2 percentage that is higher or lower than the actual percentage. During the entire calibration, it must therefore be ensured that the O_2 sensor is only exposed to ambient air.

The diagram illustrates the correlation between the air mixture during calibration and the accuracy of the oxygen measurement.



A Displayed O_2 percentage

B Actual O_2 percentage

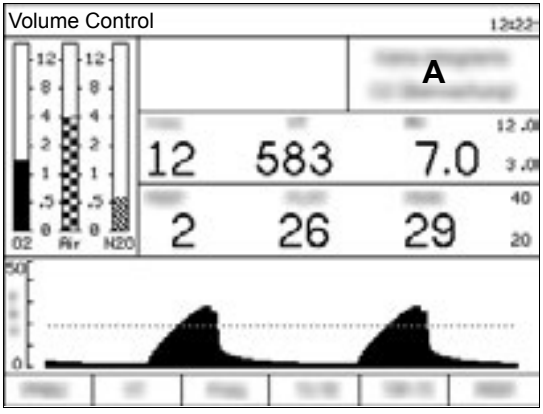
C During calibration, the sensor was exposed to ambient air with <21 % O_2. Therefore, the displayed O_2 percentage is higher than the actual O_2 percentage.

D Correct calibration with ambient air (21 % O_2) during the entire calibration time period.

Displayed O_2 percentage = actual O_2 percentage

E During calibration, the sensor was exposed to ambient air with >21 % O_2. Therefore, the displayed O_2 percentage is lower than the actual O_2 percentage.

Deactivating the O_2 monitoring



If Fabius is configured by DrägerService for operation with deactivated O_2 monitoring, the following functions of the O_2 monitoring, are deactivated:

– Parameter field for O_2 monitoring

– Setting of O_2 alarm limits

– Calibration of O_2 sensor

– Alarms for the inspiratory O_2 concentration and the O_2 sensor

The message ***No Integrated O_2 Monitoring!*** is displayed in the O_2 monitoring window (A).

NOTE

If the internal FiO_2 monitoring is deactivated, an external FiO_2 monitoring must be available in accordance with general safety standards.

Breathing volume monitoring

The breathing volume is measured by the flow sensor based on thermal anemometry. The values of the flow sensor are converted in the following parameters and displayed:

– Minute volume (***MV***)
– Tidal volume (***VT***)
– Respiratory rate (***Freq***)

CAUTION

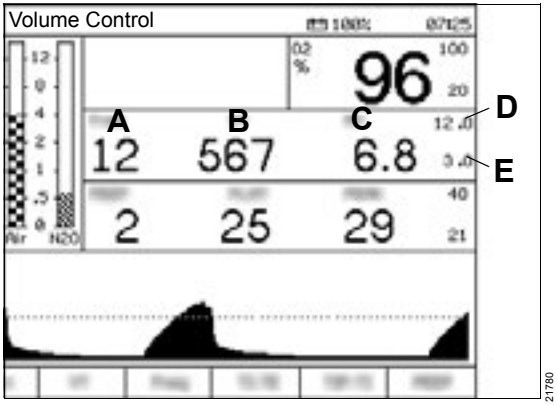
Risk of incorrect measured values

The breathing volume monitoring can be compromised by the operation of electrosurgical devices or short-wave and microwave diathermy devices in the immediate vicinity.

NOTE

Sudden, irregular expiratory flow can cause erratic changes in the display of the tidal volume and the respiratory rate. Before reading the display again, wait at least one minute.

Parameter field for breathing volume



The following information is displayed in the parameter field for breathing volume:

A The respiratory rate (***Freq***) indicates the breaths during the past minute in breaths per minute (bpm) (1/min).

The display is activated after 2 breaths.

The display range is between 2 bpm (1/min) and 99 bpm (1/min).

B The tidal volume (***VT***) indicates the expiratory volume for every breath in milliliters (mL).

The display range is between 0 mL and 1400 mL.

C The measured value for the minute volume (***MV***) continually indicates the volume of the gas breathed out in the past minute in liters per minute (L/min).

The display range is between 0.0 L/min and 99.9 L/min.

D Upper alarm limit of the minute volume in L/min

E Lower alarm limit of the minute volume in L/min

Volume alarms

Volume alarms in automatic ventilation modes

If the volume alarm messages are activated and Fabius does not detect a breath in a specific time period, the alarm ***APNOEA FLOW !!*** or ***APNOEA FLOW !!!*** is triggered, see chapter "Alarm – Cause – Remedy" on page 152.

Volume alarms in *ManSpont*

If the volume alarm messages are activated and Fabius does not detect a breath in a specific time period, after 30 seconds the alarm ***APNOEA FLOW !!*** with the priority CAUTION is triggered. If this alarm is not remedied, the priority increases after a further 30 seconds to WARNING.

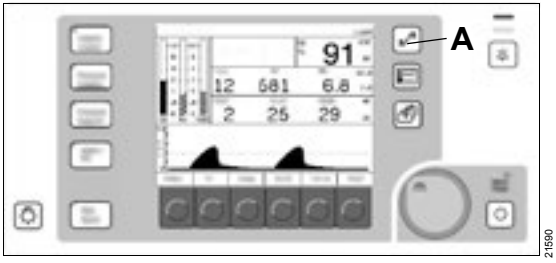
The volume alarm messages are automatically activated when changing from ***Standby*** mode in a ventilation mode.

Setting the minute volume alarm limits

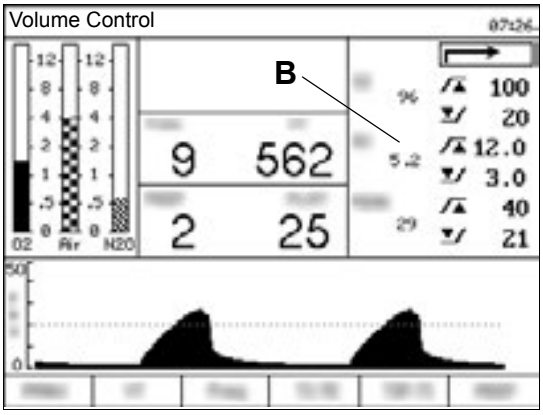
The standard alarm limits configured for the ventilation mode can be used unchanged, see chapter "Changing the alarm limits" on page 134,

or

the alarm limits can be set individually for the current case.



1 Press the (A) key.

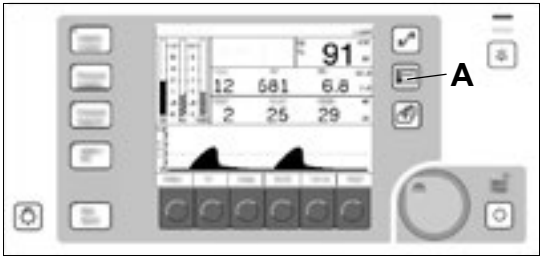


The dialog window (B) with the alarm limits opens.

2 Adjust upper and lower alarm limit values of the minute volume (***MV***), see setting ranges of the alarm parameters in chapter "Changing the alarm limits" on page 134.

3 Confirm new values.

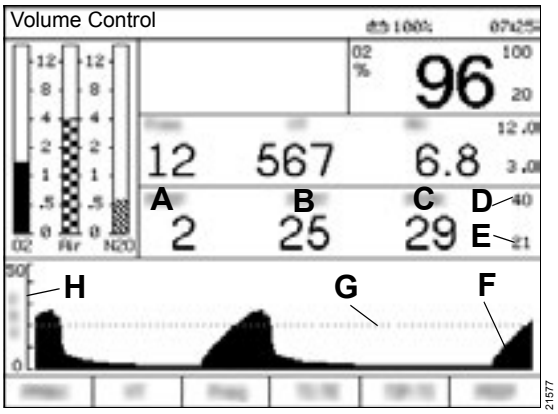
Deactivating the volume alarms



The volume alarms can be switched on and off during operation by pressing the key (A), see chapter "Switching the volume alarms on and off" on page 140.

Airway pressure monitoring

Parameter field and waveform window for airway pressure



The following parameters are displayed in numerical and graphical form in the parameter field and in waveform window for the airway pressure:

A The positive end-expiratory pressure (***PEEP***) indicates the airway pressure at the end of the expiration in cmH2O (hPa). The display range is between 0 and 30 cmH2O (0 and 30 hPa).

B The plateau pressure (***PLAT***) indicates the airway pressure at the end of the inspiration in cmH2O (hPa). The display range is between 0 and 80 cmH2O (0 and 80 hPa).

or

The mean airway pressure (***MEAN***) indicates the average of all pressure values that were recorded during a breath in cmH2O (hPa). The display range is between 0 and 50 cmH2O (0 and 50 hPa).

NOTE

Fabius can be configured by DrägerService or an authorized local service partner so that the mean airway pressure (***MEAN***) is displayed instead of the plateau pressure (***PLAT***).

C The peak pressure (***PEAK***) indicates the highest pressure value of each breath in cmH2O (hPa). The display range is between 0 and 80 cmH2O (0 and 80 hPa).

D Upper alarm limit

E Pressure threshold

F Pressure waveform

G Pressure threshold as a line

The pressure threshold is used for the detection of apnea (disconnection) and continuous pressure. If the pressure waveform does not cross the pressure threshold either from above or below, an alarm is sounded.

H Scale of the pressure waveform with display range from 0 to 20, 0 to 50, or 0 to 100 cmH2O (0 to 20, 0 to 50, or 0 to 100 hPa). The scaling is done automatically.

Pressure alarms in automatic ventilation modes

If Fabius does not detect a breath in a specific time period, the alarm ***APNOEA PRESSURE !!*** or ***APNOEA PRESSURE !!!*** is triggered, see chapter "Alarm – Cause – Remedy" on page 152.

Pressure alarms in *ManSpont*

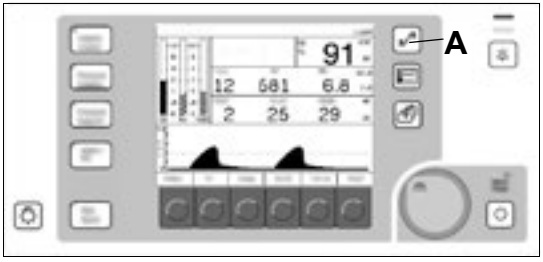
If Fabius does not detect a breath in a specific time period, after 30 seconds the alarm ***APNOEA PRESSURE !!*** with the priority CAUTION is triggered. If this alarm is not remedied, the priority increases after a further 30 seconds to WARNING.

Setting the upper alarm limit and the pressure threshold

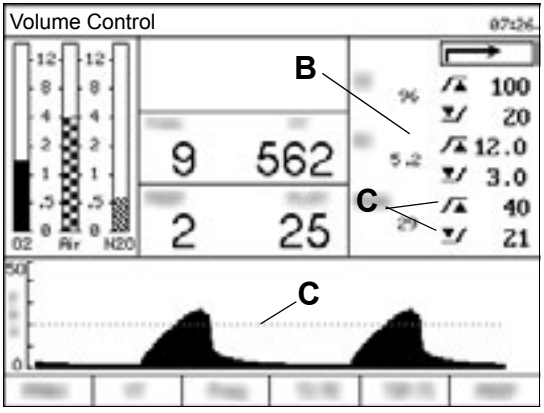
The standard alarm limits configured for the ventilation mode can be used unchanged, see chapter "Changing the alarm limits" on page 134.

or

The alarm limits can be set individually for the current case:



1 Press the (A) key.



The dialog window (B) with the alarm limits opens.

2 Adjust upper alarm limit and pressure threshold of the peak pressure (***PEAK***) (C), see chapter "Changing the alarm limits" on page 134.

3 Confirm new values.

NOTE

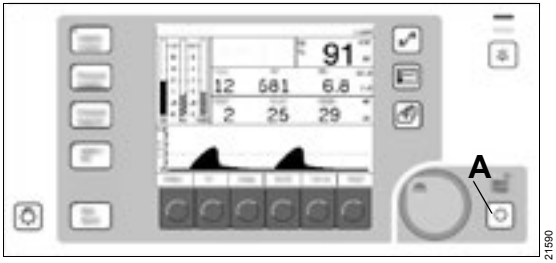
The pressure threshold is preferably to be set so that the value lies approx. 4 cmH_2O (hPa) under the current peak pressure.

Configuration

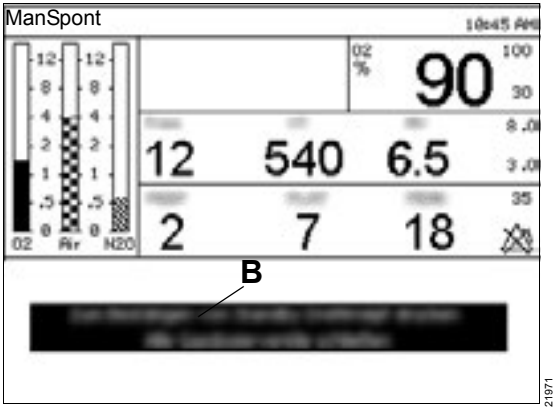
Configuration in standby mode

The following configuration functions are available in ***Standby*** mode:

– Calibrations
– System tests
– Management of default settings



1 Press the ⏻ (A) key.



The pressure waveform window is replaced by a confirmation message (B) and instructions to turn off the flow.

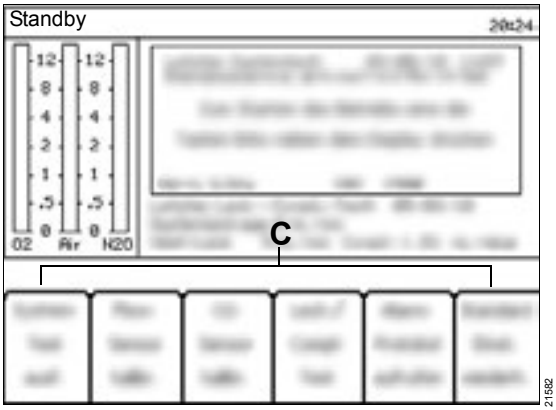
The LED of the ⏻ key (A) starts flashing. It flashes until the ***Standby*** mode is confirmed.

NOTE

If the confirmation is not done within 15 seconds, the ventilator remains in the previous mode and the pressure waveform window is restored.

2 Confirm the new mode.

The ventilator changes to ***Standby*** mode. The previous screen is replaced by the start screen ***Standby*** and the standby LED is continually lit.



The following softkeys (C) are displayed on the start screen:

– ***Run System Test***
– ***Calibrate Flow Sensor***
– ***Calibrate O_2 Sensor***
– ***Leak /Compl Test***
– ***Access Alarm Log***
– ***Restore Site Defaults***

If the flow control valves are not closed before accessing ***Standby*** mode, the following message (D) is shown on the start screen:

Gas still flowing - shut off all gas flow control valves to activate Sleep Mode.

As soon as the flow control valves are closed, the message disappears.

3 Close the flow control valves.

Power-saving mode

21975

When Fabius is in ***Standby*** mode and there is no user input for 2.5 minutes, the power-saving mode is activated. The screen is then replaced by the screensaver. Press any key to end the screensaver.

Performing the system test

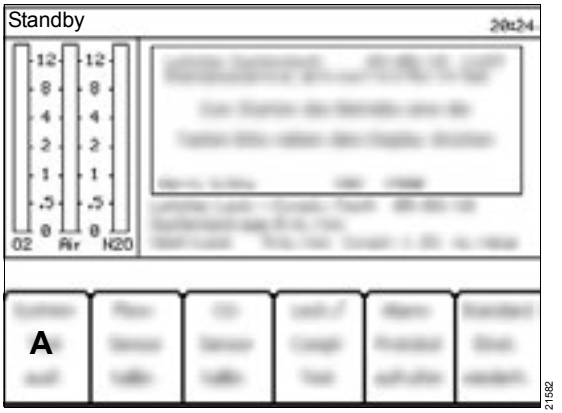
In ***Standby*** mode, a system test can be started. This test corresponds to the test that is performed automatically after switching on the anesthesia workstation. More information can be found in chapter "Switching on" on page 83.

WARNING

Risk of patient injury

During the system test, the system is pressurized.

To prevent patient injury, do not perform the system test on the medical device if a patient is connected.

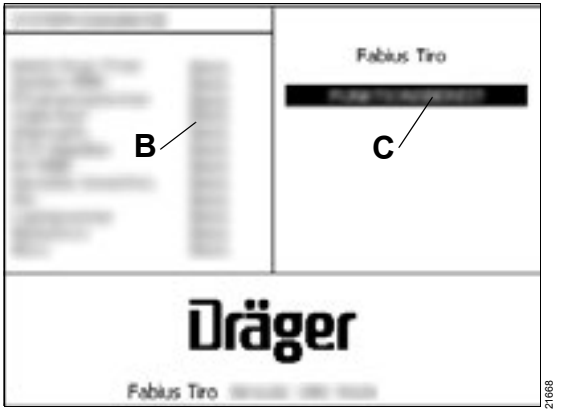


21582

1 Press the ***Run System Test*** softkey (A).

– Electrical system components are tested.

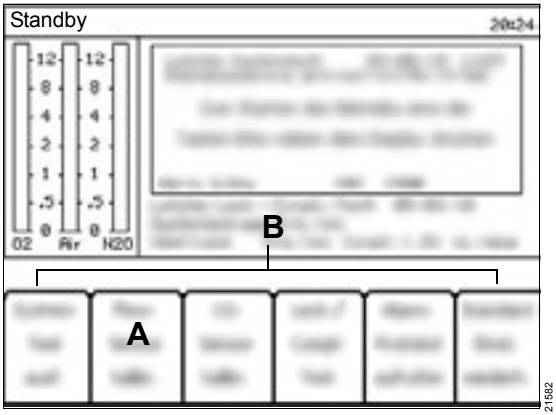
– Default settings are restored.



21668

The test results (B) are displayed on the screen. After completion of the system test, the total test results (C) are displayed, see chapter "Checking the readiness for operation" on page 85. If the system test was successful, the ***Standby*** mode is activated.

Calibrating the flow sensor



1 Press the ***Calibrate Flow Sensor*** softkey (A).

2 Follow the instructions on the screen.

At the start of the calibration, the instructions are hidden and the following message is displayed above the standby softkeys (B):

Flow Calibration in progress

After the calibration, one of the following two messages are displayed above the standby softkeys (B):

Flow Calibration completed - reconnect expiratory hose

or

Flow Calibration Failed

Troubleshooting with failed flow calibration

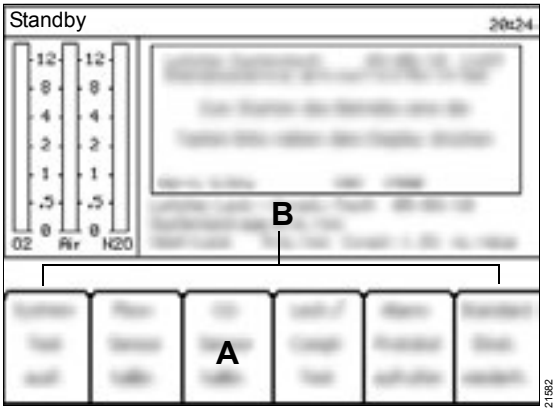
- Repeat the calibration.
- Replace the flow sensor.

If the calibration continues to fail, contact DrägerService or the authorized local service partner.

Calibrating the O_2 sensor

In order for the O_2 sensor to be correctly calibrated, it must be exposed to the ambient air during the entire calibration.

To avoid leakage, remove the O_2 sensor from the cover of the inspiratory valve. Seal the cover of the inspiratory valve with the valve cover plug.



1 Press the ***Calibrate O_2 Sensor*** softkey (A).

2 Follow the instructions on the screen.

At the start of the calibration, the instructions are hidden and the following message is displayed above the standby softkeys (B):

O_2 Calibration in progress

After the calibration, one of the following two messages are displayed above the standby softkeys (B):

O_2 Sensor Calibration completed - reinsert O_2 sensor

or

O_2 Sensor Calibration Failed

Troubleshooting with failed O_2 calibration

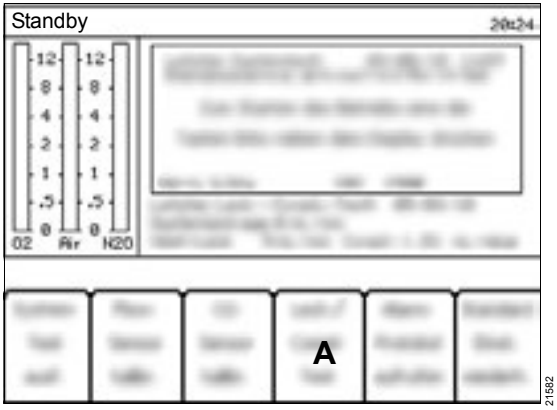
- Replace the O_2 sensor capsule in the O_2 sensor housing, see chapter "Inserting a new O_2 sensor capsule" on page 75.

If the calibration continues to fail, contact DrägerService or the authorized local service partner.

Leakage test

The following tests are initiated during the leakage test:

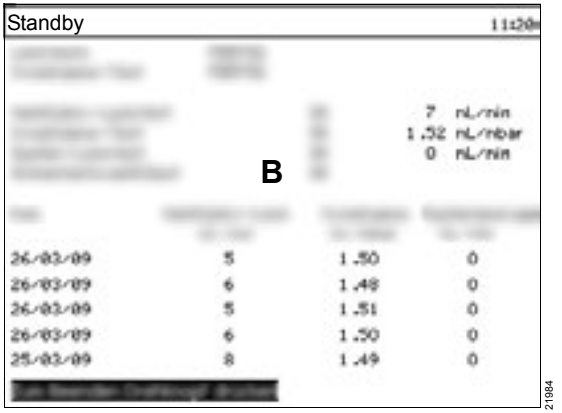
– ***Compliance Test***
– ***System Leak Test***
– ***Ventilator Leak Test***
– ***Safety Relief Valves Test***



21582

1 Press the ***Leak /ComplTest*** softkey (A).

2 Follow the instructions on the screen.



21984

After completion of the tests, the results (B) are displayed on the screen.

3 To return to the start screen, press the rotary knob.

Results of the compliance test

This test determines the system compliance including breathing system, breathing hoses, filter, and Y-piece.

The system compliance is required to ensure in ***Volume Control*** mode that the applied tidal volume corresponds to the set tidal volume.

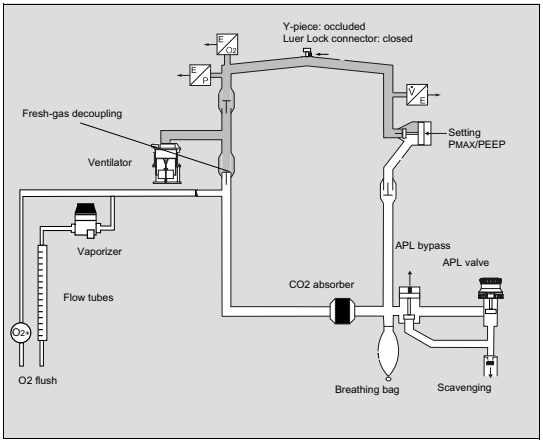
System compliance [mL/cmH_2O]	**Displayed result [mL/cmH_2O]**
≤6.5	Measured value and ***PASSED***

The value of the compliance is displayed on the ***Standby*** screen.

Results of the ventilator leakage test

The test of the ventilator leakage can have the following results:

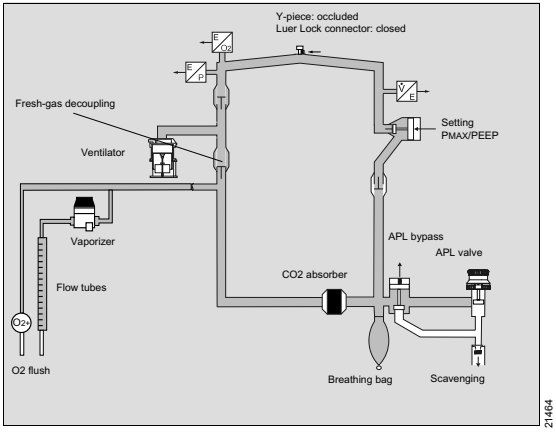
Ventilator leakage [mL/min]	Displayed result [mL/min]
150	Measured value and ***PASSED***
151 to 250	Measured value and ***FAILED***
>250	>250 and ***FAILED***



Results of the system leakage test

The test of the system leakage can have the following results:

System leakage [mL/min]	Displayed result [mL/min]
250	Measured value and ***PASSED***
251 to 350	Measured value and ***FAILED***
>350	>350 and ***FAILED***



Test of the overpressure safety valve

This test checks the functionality of the overpressure safety valve.

The test results are displayed on the screen with the leakage test results (B).

Troubleshooting with failed test of the overpressure safety valve

WARNING

Risk of unexpected occurring overpressure

A soiled or non-functioning overpressure safety valve is not able to compensate for suddenly occurring overpressure in the breathing system.

Perform the leakage test before start-up of the device. Observe the test results of the overpressure safety valve.

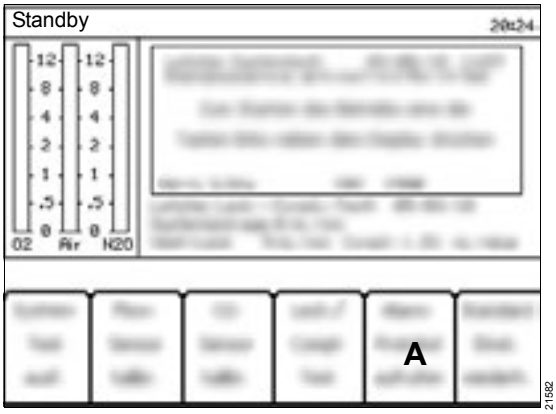
- Repeat leakage test. If the test of the overpressure safety valve continues to fail, contact DrägerService or the authorized local service partner.

Accessing the alarm logbook

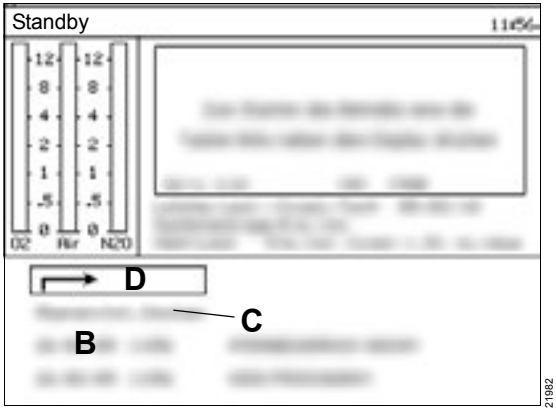
The alarm logbook lists all alarm messages with the respective date and time.

Up to a maximum of 100 entries can be saved.

When the storage limit is reached, the oldest entries are overwritten.



1 Press the ***Access Alarm Log*** softkey (A).



2 To scroll through the alarm logbook (B), turn the rotary knob.

Clearing the alarm logbook

- Select ***Clear Alarm Log*** (C) and confirm

Closing the alarm logbook

- Select the input arrow (D) and confirm.

The screen changes to ***Standby*** mode.

CAUTION

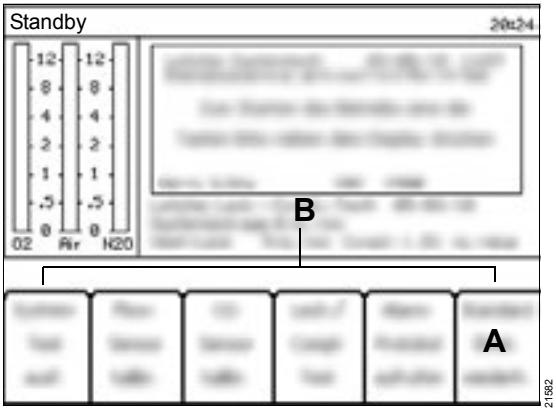
Risk of losing data

All data in the alarm logbook are cleared in the following cases:
– Fabius is switched off.
– The system test is started in standby mode.
– The power supply fails.

Restoring the default settings

The default settings are restored in the following cases:

– Switching Fabius on and off
– Performing the system test
– Pressing the softkey ***Restore Site Defaults***



1 Press the ***Restore Site Defaults*** softkey (A).

The default settings are restored. The following message is displayed using the standby softkeys (B):

Site Default settings restored

The default settings can be adjusted on the ***Standby Set-up*** screen. Adjustment of the default settings is password-protected.

WARNING

Risk due to unsuitable ventilation settings

After the default settings are restored, check whether the settings for the ventilation and monitoring are suitable for the patient.

Page *Standby Set-up*

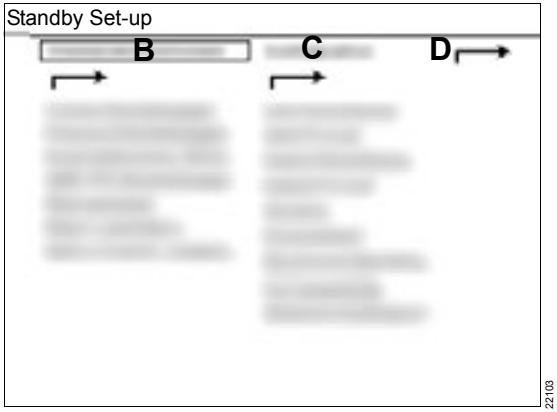
Pressing the key in ***Standby*** mode provides access to various default settings and configuration settings.

Access is password-protected. On request the password can be deactivated or a personal password can be defined.

The settings made are saved as default settings and configurations.

1 Press the (A) key.

The ***Standby Set-up*** screen opens

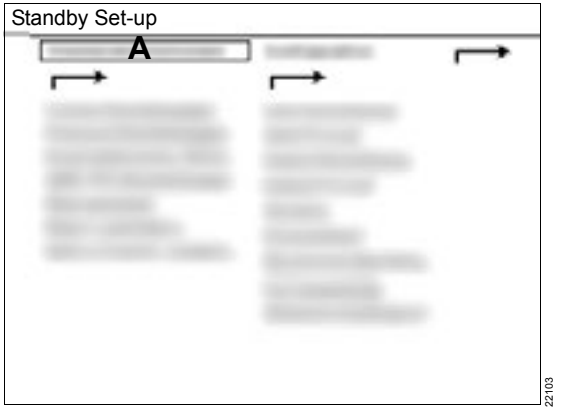


2 Select ***Default Settings*** (B) or ***Configuration*** (C) with the cursor.

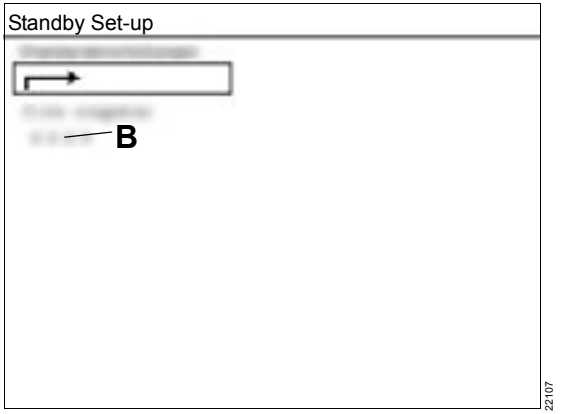
By selecting and confirming with the input arrow (D), the screen changes back to the ***Standby*** screen.

Changing the default settings

1 On the ***Standby Set-up*** screen, select ***Default Settings*** (A) and confirm.

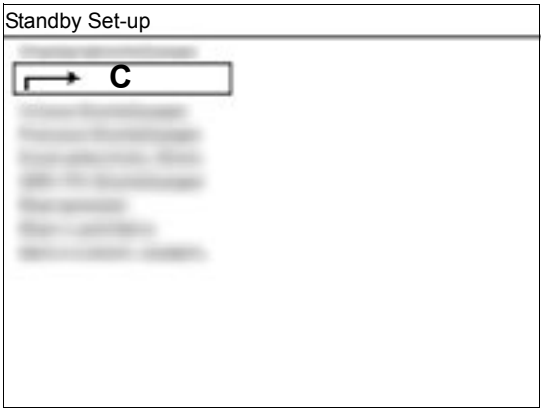


The screen with the password query opens.



2 In the displayed row, select the digits in sequence and confirm.

The screen with the default settings opens.

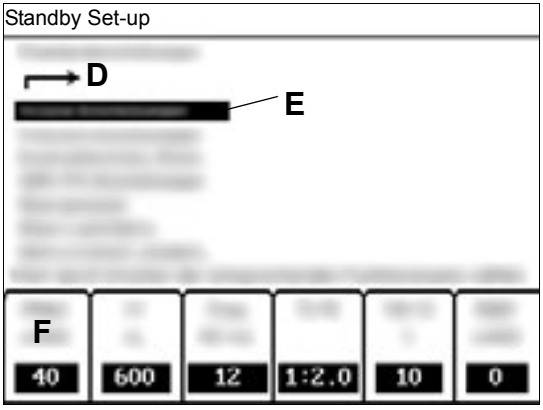


The following settings can be changed:

– ***Volume Settings***
– ***Pressure Settings****
– ***Pressure Support Settings****
– ***SIMV/PS Settings****
– ***Alarm Limits***
– ***Minimum Alarm Volume***
– ***Restore Factory Defaults***

- To return to the ***Standby Set-up*** screen, select the input arrow (C) and confirm.

Default settings for *Volume Control*



1 Select ***Volume Settings*** (E) and confirm.
2 Press softkey (F) of the parameter to be changed.
3 Select new value and confirm.
4 If necessary, repeat steps 2 and 3 for other parameters.
5 Finally, confirm all changes once again.

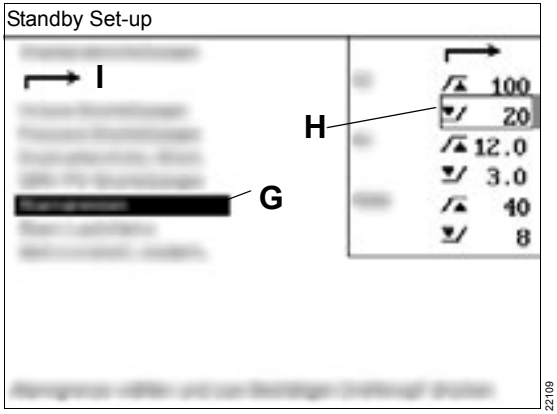
The window is closed, the cursor is on the input arrow (D).

Default settings for *Pressure Control*, *Pressure Support*, and *SIMV/PS*

- Change the parameters (see description in section "Default settings for Volume Control" on page 133).

* optional

Changing the alarm limits



1 Select ***Alarm Limits*** (G) and confirm.

2 Select the alarm limits (H) to be changed and confirm.

3 Select new value and confirm.

4 If necessary, repeat steps 2 and 3 for other alarm limits.

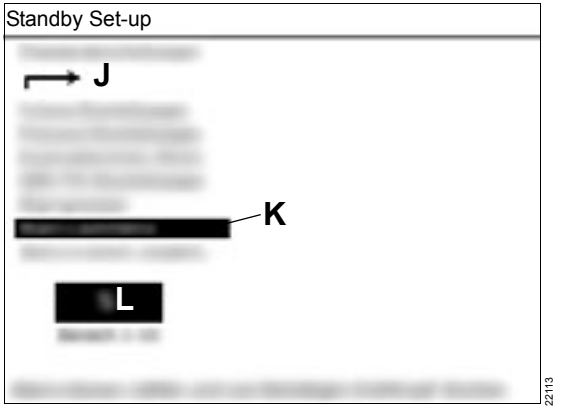
5 Select the input arrow (I) and confirm.

The window is closed.

In the following table, the values for the setting ranges and factory settings are listed for all alarm limits of Fabius.

Alarm parameter		Setting range	Factory setting
O_2	▲	19 to 100	100
[%]	▼	18 to 99	20
MV	▲	0.1 to 20.0	12.0
[L/min]	▼	0.0 to 19.9	3.0
Pressure	▲	10 to 70	40
[[cmH_2O] (hPa)]	▼	5 to 30	8

Changing the minimum alarm volume



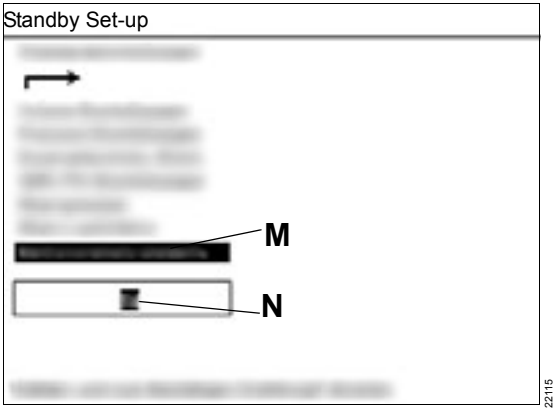
1 Select ***Minimum Alarm Volume*** (K) and confirm.

The current minimum alarm volume (L) is displayed on the screen.

2 Set the new minimum alarm volume to a value between 1 (minimum) and 10 (maximum) and confirm.

The window is closed, the cursor is on the input arrow (J).

Restoring the factory settings



1 Select ***Restore Factory Defaults*** (M) and confirm.

2 Select ***Yes*** or ***No*** (N) and confirm.

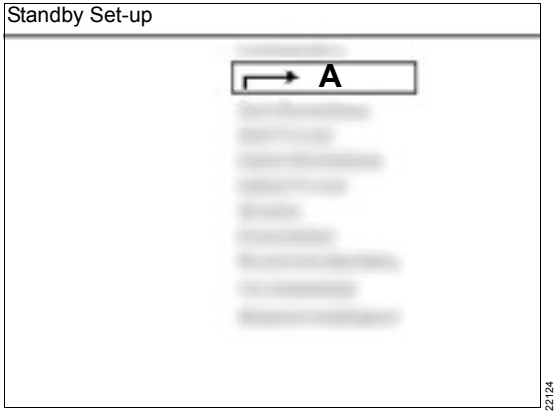
If ***Yes*** is selected, the factory settings are restored. The factory settings replace the current default settings.

The values for the factory settings for Fabius are listed in the following table.

Parameter	Factory setting
Volume Control	***PMAX***= 40 ***VT***= 600 ***Freq***= 12 ***TI:TE***= 1:2.0 ***TIP:TI***= 10 ***PEEP***= 0
Pressure Control	***PINSP***= 15 ***Freq***= 12 ***TI:TE***= 1:2.0 ***Insp Flow***= 30 ***PEEP***= 0
Pressure Support	***ΔPPS***= 10 ***Freq Min***= 3 ***Trigger***= 2 ***Insp Flow***= 30 ***PEEP***= 0
SIMV/PS	***PMAX***= 40 ***VT***= 600 ***Freq***= 12 ***ΔPPS***= 10 ***PEEP***= 0 ***Trigger***= 2 ***Insp Flow***= 30 ***TINSP***= 1.7 ***TIP:TI***= 10
Alarm limits for O_2	Upper value = 100 Lower value = 20
Alarm limits for ***MV***	Upper value = 12.0 Lower value = 3.0
Upper alarm limit and pressure threshold for ***PEAK***	Upper value = 40 Lower value = 8
Minimum Alarm Volume	Volume = 5

Changing the configurations

1 On the ***Standby Set-up*** screen, select ***Configuration*** and confirm.



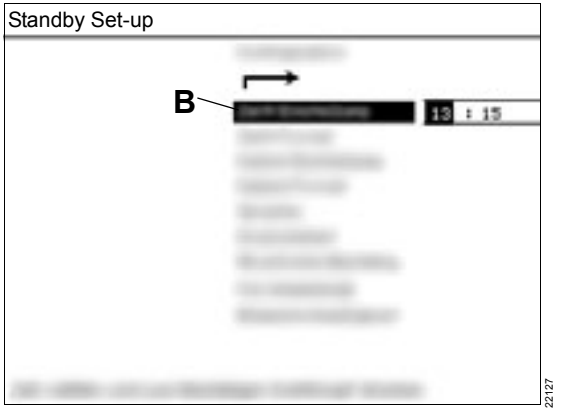
The screen with the configuration settings opens.

The following settings can be changed:

– ***Time Set***
– ***Time Format***
– ***Date Set***
– ***Date Format***
– ***Language***
– ***Pressure Unit***
– ***Acoustic Confirmation***
– ***Waveform Display***
– ***Display Background***

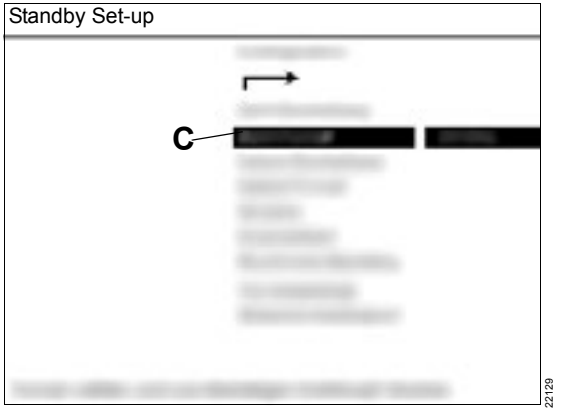
- To return to the ***Standby Set-up*** screen, select the input arrow (A) and confirm.

Changing the time



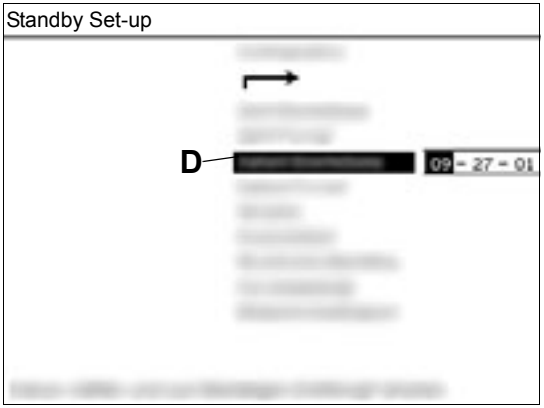
1 Select ***Time Set*** (B) and confirm.
The cursor is in the hour field.
2 Select new value and confirm.
The cursor moves to the minute field.
3 Select new value and confirm.
The window is closed.

Changing the time format



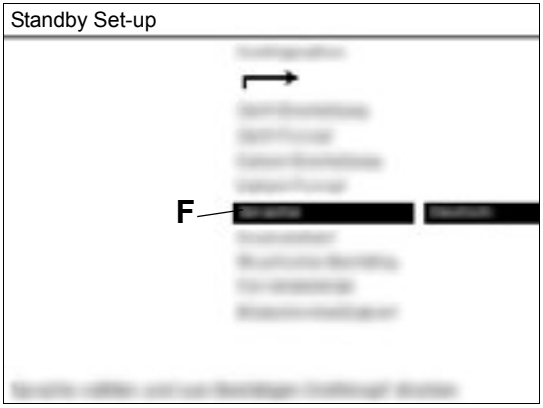
1 Select ***Time Format*** (C) and confirm.
2 Select new format and confirm.
The window is closed.

Changing the date



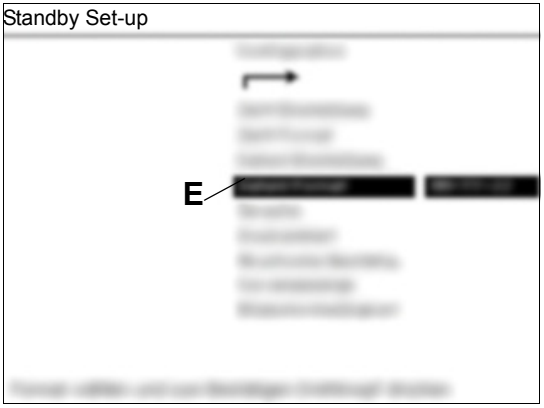
1 Select ***Date Set*** (D) and confirm.
2 Select new value and confirm.
The window is closed.

Changing the language



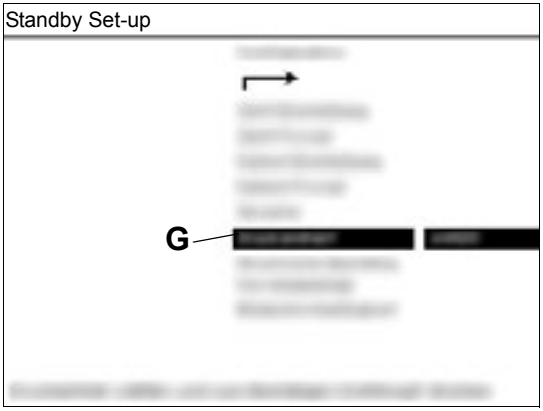
1 Select ***Language*** (F) and confirm.
2 Select language and confirm.
The window is closed.

Changing the date format



1 Select ***Date Format*** (E) and confirm.
2 Select new format and confirm.
The window is closed.

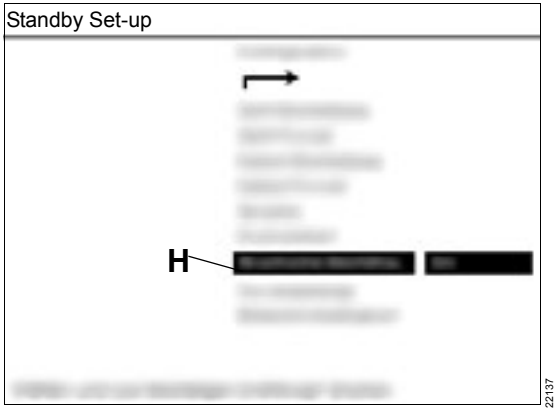
Changing the pressure unit



1 Select ***Pressure Unit*** (G) and confirm.
The following units can be selected:
- ***hPa***
- ***cmH2O***
- ***mbar***
- ***kPa***

2 Select new unit and confirm.
The window is closed.

Activating the acoustic confirmation



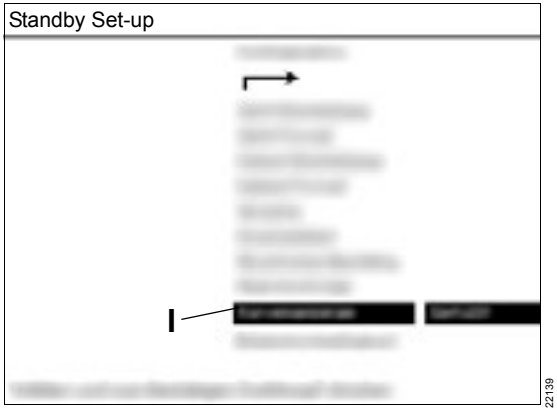
When the function ***Acoustic Confirmation*** is switched on, a tone is sounded when pressing the rotary knob.

1 Select ***Acoustic Confirmation*** (H) and confirm.

2 Select ***On*** or ***Off*** and confirm.

The window is closed.

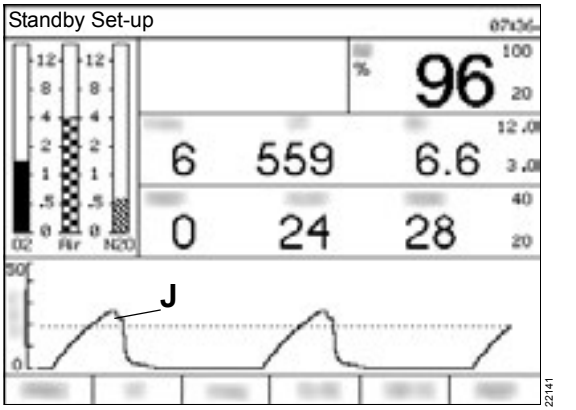
Changing the waveform display



1 Select ***Waveform Display*** (I) and confirm.

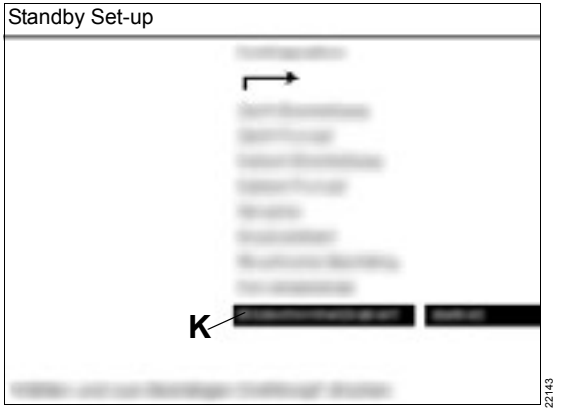
2 Select ***Normal*** or ***Filled*** curve display and confirm.

The window is closed.



When the setting ***Normal*** is selected, the pressure waveform (J) is not shown as a filled area, but as a line.

Changing the screen brightness*



1 Select ***Display Background*** (K) and confirm.

2 Select ***Light*** or ***Dark*** screen brightness and confirm.

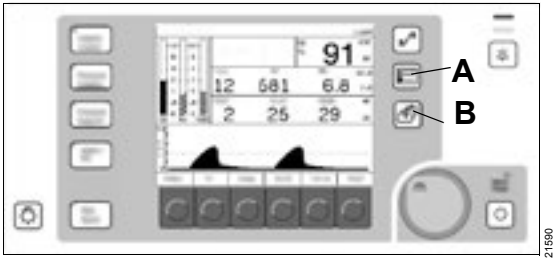
The window is closed.

* available only with optional color screen

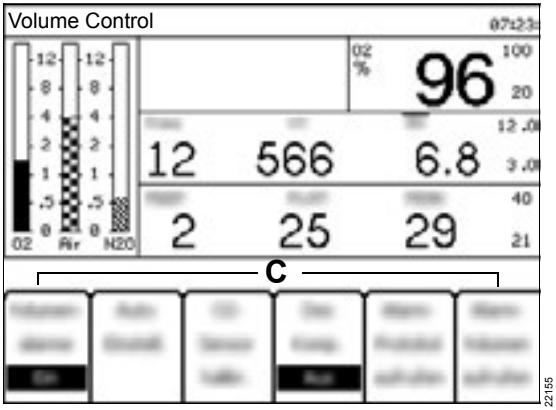
Configuration during operation

If Fabius is in one of the ventilation modes, the following configuration functions can be performed:

– Calibration of the O_2 sensor
– Displaying and changing the monitoring settings
– Changing configurations



1 Press the (A) key.



The pressure waveform is no longer displayed.

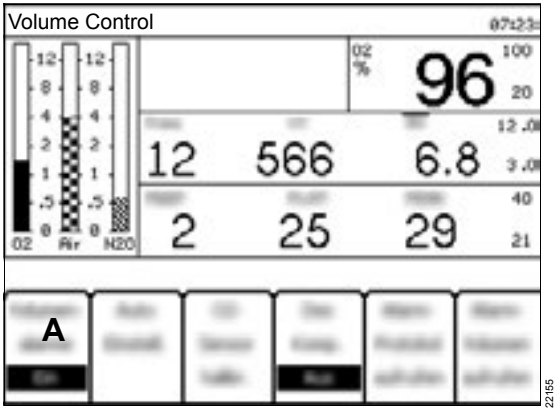
The following softkeys (C) are displayed on the screen, e.g., in ***Volume Control*** mode:

– ***Volume Alarms ON/OFF***
– ***Auto Set***
– ***Calibrate O_2 Sensor***
– ***Des Comp ON/OFF***
– ***Access Alarm Log***
– ***Access Alarm Volume***

If no change is made within 15 seconds, the pressure waveform is displayed again.

Pressing the key (B) will also cause the pressure waveform window to be displayed again.

Switching the volume alarms on and off



1 Press the ***VolumeAlarms ON*/*OFF*** softkey (A).

The key label changes from ***Volume Alarms ON*** to ***Volume Alarms OFF***.

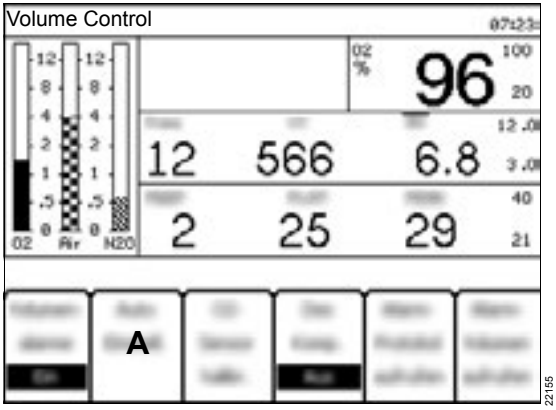
Instead of the upper and lower alarm limits, the symbol appears, indicating the alarm is deactivated.

The volume alarms are deactivated.

NOTE

The function ***Volume Alarms ON*** /***OFF*** is available in the standard view of the ***ManSpont*** mode. If the key is pressed in ***ManSpont*** mode, the softkey ***Volume Alarms ON*** /***OFF*** is not displayed.

Automatic setting of the pressure threshold



1 Press the ***AutoSet*** softkey (A).

The pressure threshold for the peak pressure (***PEAK***) is set to 4 cmH_2O (hPa) below the current plateau pressure (***PLAT***).

NOTE

The pressure threshold must not be below 5 cmH_2O (5 hPa) or above 30 cmH_2O (30 hPa).

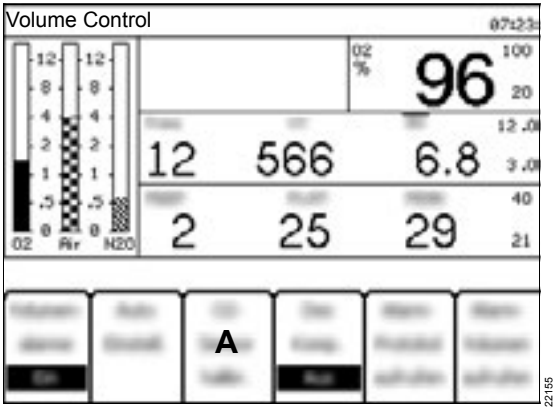
NOTE

If no current measured value is available for the plateau pressure (***PLAT***), pressing the softkey has no effect.

NOTE

In ***SIMV/PS*** mode, the pressure threshold depends on the pressure of the mandatory breaths.

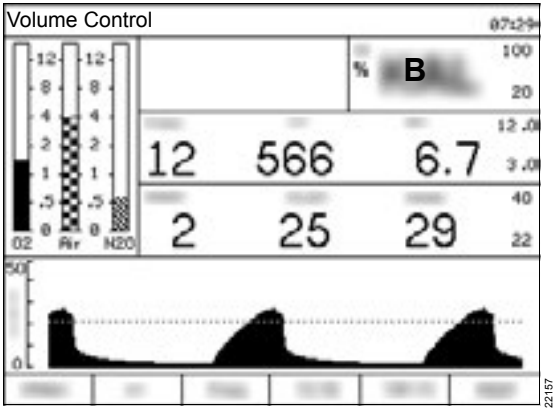
Calibrating the O_2 sensor



1 Press the ***CalibrateO2 Sensor*** softkey (A).

2 Follow the instructions on the screen.

To calibrate the O_2 sensor, proceed as described in chapter "Calibrating the O_2 sensor" on page 127.

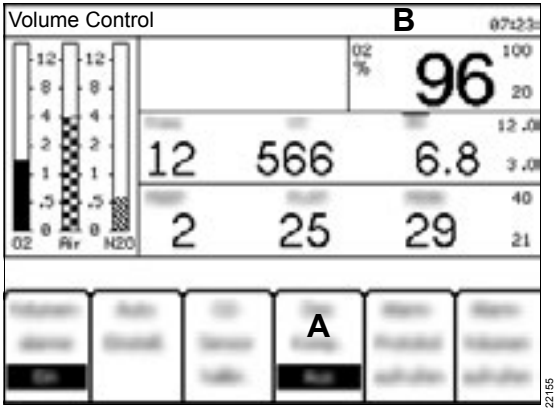


During the calibration, the O_2 value in the window (B) of the O_2 monitoring is replaced by the word ***CAL***. The calibration time is approx. 15 seconds. After successful calibration, the O_2 measured value is again displayed.

- If the calibration was not successful, replace the O_2 sensor capsule in the O_2 sensor housing, see chapter "Inserting a new O_2 sensor capsule" on page 75.

If the calibration continues to fail, contact DrägerService or the authorized local service partner.

Switching the desflurane compensation on and off



The desflurane compensation optimizes the volume measurement when desflurane is used.

CAUTION

Risk of inaccurate measured values

If the activation of the desflurane compensation is forgotten during the use of desflurane or if the desflurane compensation is activated even though desflurane is not being used, the accuracy of the volume measurement can be influenced.

Only switch on desflurane compensation if desflurane is used.

CAUTION

Risk of inaccurate measured values

If an anesthetic gas monitor is used, the automatic desflurane compensation is activated. Faulty anesthetic gas monitors can influence the accuracy of the measured volume.

Make sure that the anesthetic gas monitor functions correctly.

CAUTION

Risk of inaccurate measured values

Desflurane influences the measurement accuracy of the flow sensor.

If desflurane is used, activate the desflurane compensation.

1 Press the ***DesComp OFF*** softkey (A).

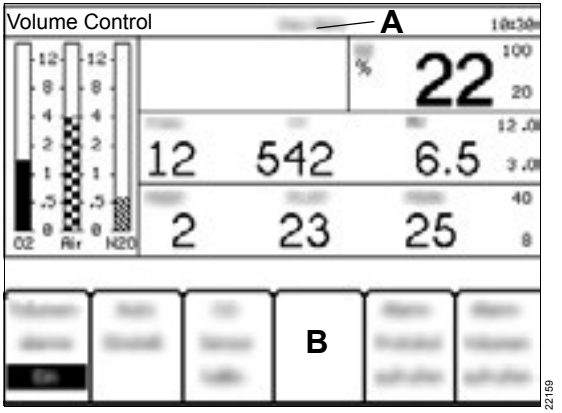
The key label changes from ***DesComp OFF*** to ***DesComp ON***.

The desflurane compensation is activated.

The message ***Des on*** is displayed in the status bar (B).

Automatic desflurane compensation

Prerequisite: External gas analyzer is connected to Fabius via the RS232 interface.



NOTE

If data for anesthetic gas concentration is available via the communication with an external gas analyzer, Fabius compensates desflurane automatically. In this case, the transmitted data cancel the function of the softkey for desflurane compensation.

If the connected anesthetic gas monitor detects desflurane, Fabius reacts as follows:

– ***Des auto*** is displayed in the status bar (A).
– The softkey ***DesComp ON/OFF*** (B) is no longer displayed.

If the communication to the anesthetic gas monitor fails, Fabius reacts as follows:

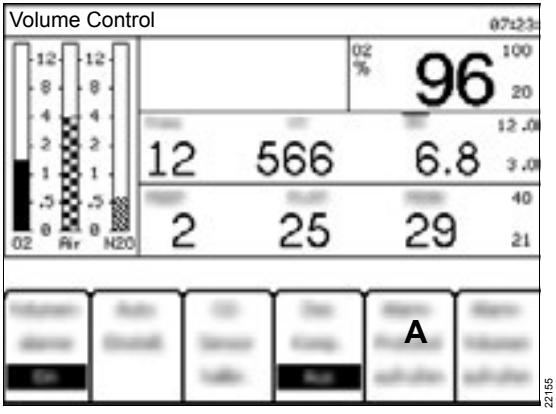
– The automatic desflurane compensation is switched off.
– The message ***Des auto*** in the status bar (A) is no longer displayed.
– The softkey ***DesComp OFF*** (B) is displayed.

To switch the desflurane compensation back on:

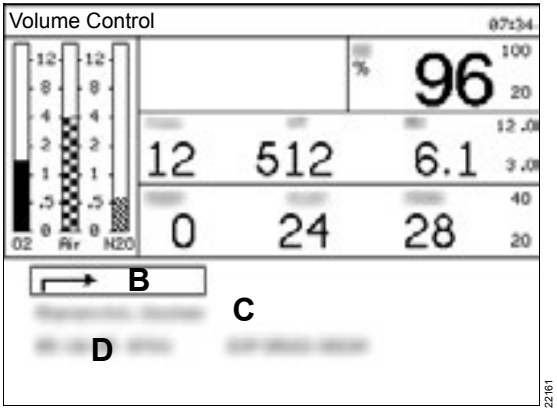
- Press the ***DesComp OFF*** softkey (B).

The label of the softkey changes to ***DesComp ON***.

Accessing the alarm logbook



1 Press the ***AccessAlarm Log*** softkey (A).



2 To scroll through the alarm logbook (D), turn the rotary knob.

Clearing the alarm logbook

- Select ***Clear Alarm Log*** (C) and confirm.

Closing the alarm logbook

- Select the input arrow (B) and confirm.

  The pressure waveform and softkeys are displayed again.

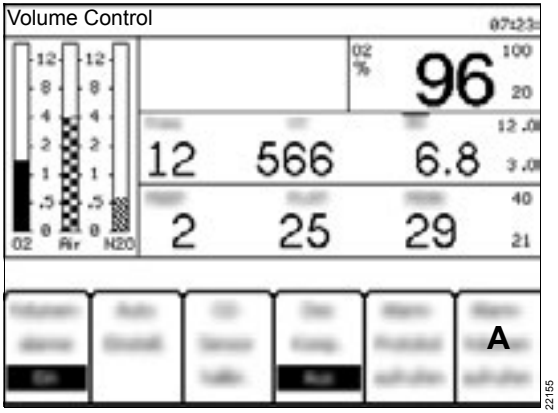
Changing the alarm volume

WARNING

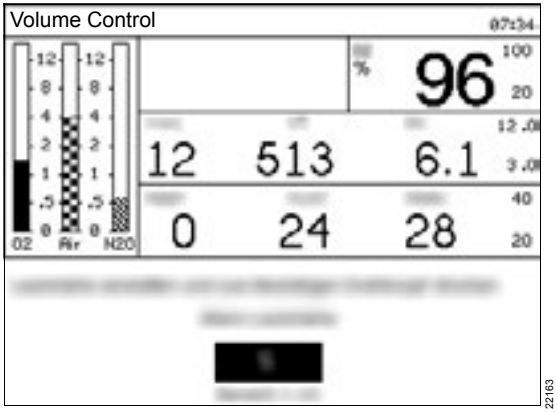
Risk of not hearing the alarm tone

When operating in a loud environment, the acoustic alarm signals may not be heard.

Always set the alarm tone to a sufficient volume.



1 Press the ***AccessAlarm Volume*** softkey (A).



2 Set the new alarm volume to a value between 1 (minimum) and 10 (maximum) and confirm.

The lower value is limited by the setting in the standby configuration (see chapter "Changing the minimum alarm volume" on page 134).

The pressure waveform and softkeys are displayed again.

Troubleshooting

Locating and remedying leakages

Leakages can lead to a failure of the system test or the leakage test and must be remedied.

CAUTION

Risk due to contamination

Anesthetic gas can get into the ambient air as a result of leakages.
– Perform the leakage test before using the device.
– Remedy all leakages.

CAUTION

Risk due to leakage at the valves

Leakages at valves can allow ambient air to enter the breathing system and alter the composition of the breathing gas.
– Perform the leakage test before using the device.
– Check all valves for leakage.

CAUTION

Risk of insufficient ventilation

Breathing gas may escape because of leakages, with the result that the applied volume is less than the set volume.
– Perform the leakage test before using the device.
– Remedy all leakages.

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 microbial filter is incorrectly fitted or damaged.
– The holder for the breathing bag is incorrectly mounted to the breathing system. The sealing ring is soiled or damaged.
– 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.
– The O-rings on the inspiratory port or expiratory port are damaged, soiled, or missing.
– The flow sensor is incorrectly installed or damaged. The rear O-ring is missing.
– The valves or seals of the breathing system are damaged.
– The cone for occluding the Y-piece 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 in the 0 position.

Systematic localization of leakages

To find causes of leakages, isolate individual components from the leakage test.

Component	Measure
Sample line	Remove the sample line. Occlude 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 leakages. Connect the breathing bag directly to the breathing system.
Vaporizers	Remove the vaporizers.

1 Perform the leakage test, see chapter "Leakage test" on page 128.

2 Contact service personnel if the leakages cannot be localized.

Power supply failure

Mains power supply failure

If mains power fails, Fabius automatically switches to the internal battery. With a fully charged battery the supply of the ventilator and the internal monitor functions are maintained for up to 2 hours.

The remaining battery charge is displayed in the status bar.

The operating time of the battery depends on the ventilation settings and the condition of the battery (age and battery charge). A completely charged battery can ensure supply for at least 45 minutes.

In battery operation and in case of decreasing battery charge, the following information is displayed:

– The battery symbol  is displayed in the status bar and the LED indicator for mains power supply goes out.
– The note ***POWER FAIL !*** is displayed in the alarm window.
– When the remaining battery charge drops below 20%, the note ***BATTERY LOW !*** is displayed in the alarm window.
– When the remaining battery charge drops below 10%, the note in the alarm window is replaced by the alarm ***BATTERY LOW !!***.
– Shortly before the battery is empty, the ventilator is switched off and the alarm ***VENTILATOR FAIL !!!*** is displayed in the alarm window.
– If no manual ventilation follows, the following alarm messages are displayed:
  – ***APNOEA PRESSURE !!!***
  – ***APNOEA FLOW !!!***
  – ***MINUTE VOLUME LOW !!***

The monitoring functions remain in operation until the battery is completely discharged and all electronic components are switched off.

CAUTION

Risk of device malfunction

If mains power fails, devices connected to the auxiliary power sockets are not supplied from the internal battery.

Ensure an alternative power supply for connected devices.

WARNING

Insufficient ventilation of the patient

If the alarm message *BATTERY LOW !!* (remaining battery charge 10%) is displayed for the first time, the ventilator still remains in operation for up to 10 minutes.

Restore mains power supply. Afterwards, the automatic ventilation is available again.

WARNING

Risk of patient injury

When the battery is empty, Fabius switches off automatically.

Never completely discharge the battery. However, if there is a complete discharge of the battery, charge the battery immediately. The device must not be used until the battery is completely charged again.

When the battery is completely empty, Fabius switches off and generates an acoustic alarm signal (continuous tone for approx. 30 seconds). All customized settings, including the alarm limits, that deviate from the default settings are lost.

The following ventilation modes are still possible:

– Manual ventilation
– Spontaneous breathing

All pneumatic functions of Fabius are still available:

– APL valve
– Pressure gauge for the airway pressure
– Pressure gauge for gas cylinders and central gas supply
– Fresh-gas supply and anesthetic agent delivery
– S-ORC
– Flow control valves for O_2, Air, and N_2O

WARNING

Incorrect patient settings

When the power supply is restored and Fabius is restarted, all ventilation and alarm settings are reset to default settings.

After the restart of Fabius, check all settings and adjust to the patient if necessary.

Ventilator failure

Alarm *VENTILATOR FAIL !!!*

If the ventilator does not return to its initial state, the alarm ***VENTILATOR FAIL !!!*** activates.

Only manual ventilation or spontaneous breathing is possible.

No other ventilation modes can be selected.

In this case, proceed as follows:

1 Change to ***ManSpont*** ventilation mode.

2 Set the APL valve to position ***Man***.

3 Set the APL valve to the desired pressure.

4 Fill the breathing bag, if necessary with the aid of the O_2 flush key.

5 Manually ventilate the patient.

Bypassing the ventilator

In the following cases, the ventilator must be bypassed so that the ventilation can be continued.

– The ventilator does not return to its initial state after a malfunction.

and

– The spontaneous breathing mode cannot be activated.

To bypass the ventilator, proceed as follows:

1 Set the On/Off switch on the rear of Fabius to ○ (off).

2 Set the On/Off switch back to ◉ (on).

Fabius restarts and performs a selftest. More information on the selftest can be found in section "Checking the readiness for operation" on page 85.

1 Select ventilation mode ***ManSpont***.

2 Set the APL valve to position ***Man***.

3 Set the APL valve to the desired pressure.

4 Fill the breathing bag, if necessary with the aid of the O_2 flush key.

5 Manually ventilate the patient.

Before starting the ventilation with an automatic ventilation mode, contact DrägerService or the authorized local service partner.

Failure of the O_2 sensor

Causes for faulty calibration

The calibration was not successful if, after the calibration of the O_2 sensor, the alarm message ***O_2 SENSOR FAIL !*** is displayed.

Possible causes and remedial measures are described in the following table.

Cause	**Remedy**
During the calibration, the O_2 sensor was exposed to an air mixture with extremely high or low oxygen concentration.	Make sure that the O_2 sensor is exposed to ambient air during the entire calibration.
During the calibration, the O_2 sensor was exposed to an air mixture with fluctuating oxygen concentration.	Make sure that the O_2 sensor is exposed to ambient air during the entire calibration.
The O_2 sensor was not exposed to ambient air long enough before the calibration.	Expose the O_2 sensor to ambient air for 2 minutes. When a new O_2 sensor is connected, expose the new sensor to ambient air for 15 minutes.
The maximum period of use of the O_2 sensor has elapsed.	Replace the O_2 sensor. Expose the new O_2 sensor to ambient air 15 minutes before calibration.
The O_2 sensor is not connected.	Check the O_2 sensor. Connect the O_2 sensor correctly and recalibrate.

Alarm – Cause – Remedy

Alarm messages are displayed in hierarchical form in the alarm message field of the main screen, see chapter "Screen display" on page 45.

The priority of the alarm messages is marked by exclamation points.

The alarm messages are only displayed on colored background if the option "Color display" is activated.

Warning	!!!	Red
Caution	!!	Yellow
Note	!	White

Within an alarm priority, the alarm messages are assigned internal priorities. In the following table, these internal priorities are indicated as numbers.

The alarm message with the highest priority has the number 31. The lower the priority, the lower the number.

The table lists possible causes and the corresponding remedial measures of an alarm. Causes and remedial measures must be processed in the sequence they are listed until the alarm no longer occurs. The alarm messages are listed in alphabetical order.

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

Alarm priority	Alarm	Cause	Remedy
(31)	***AIRWAY PRESSURE HIGH !!!***	The upper alarm limit for the airway pressure was exceeded, the breathing hose is kinked.	Check the breathing circuit connected to the anesthesia workstation.
(31)	***AIRWAY PRESSURE HIGH !!!***	The alarm limit was set too low.	Check the breathing system or the alarm limit.

Alarm priority	Alarm	Cause	Remedy
(23/31)	***APNOEA FLOW !!***	The apnea flow alarm based on a time staggering. In the ***Volume Control***, ***Pressure Control***, ***SIMV/PS*** modes with ***Freq*** ≥ 6 or in ***Pressure Support*** mode with apnea ventilation deactivated: Caution = ***VT*** <20 mL for >15 seconds In the ***ManSpont***, ***SIMV/PS*** modes with ***Freq*** < 6 or in ***Pressure Support*** mode with apnea ventilation activated: Caution = ***VT*** <20 mL for >30 seconds	
		Breathing/ventilation stopped.	Check ventilator.
		Leakage or disconnection in the breathing system.	Check breathing system.

Alarm priority	Alarm	Cause	Remedy
(23/31)	***APNOEA FLOW !!!***	The apnea flow alarm based on a time staggering. In the ***Volume Control***, ***Pressure Control***, ***SIMV/PS*** modes with ***Freq*** ≥ 6 or in ***Pressure Support*** mode with apnea ventilation deactivated: Warning = ***VT*** <20 mL for >30 seconds In the ***ManSpont***, ***SIMV/PS*** modes with ***Freq*** < 6 or in ***Pressure Support*** mode with apnea ventilation activated: Warning = ***VT*** <20 mL for >60 seconds	
		Breathing/ventilation stopped.	Check ventilator.
		Leakage or disconnection in the breathing system.	Check breathing system.

Alarm priority	Alarm	Cause	Remedy
(23/31)	***APNOEA PRESSURE !!***	The apnea pressure alarm is based on a time staggering. In the ***Volume Control***, ***Pressure Control***, ***SIMV/PS*** modes with ***Freq*** ≥ 6 or in ***Pressure Support*** mode with apnea ventilation deactivated: Caution = ***PAW*** did not exceed the pressure threshold value for a duration of >15 seconds. In the ***ManSpont***, ***SIMV/PS*** modes with ***Freq*** < 6 or in ***Pressure Support*** mode with apnea ventilation activated: Caution = ***PAW*** did not exceed the pressure threshold value for a duration of >30 seconds.	
		Breathing/ventilation stopped.	Check ventilator.
		Leakage or disconnection in the breathing system.	Check breathing system.

Alarm priority	Alarm	Cause	Remedy
(23/31)	***APNOEA PRESSURE !!!***	The apnea pressure alarm is based on a time staggering. In the ***Volume Control***, ***Pressure Control***, ***SIMV/PS*** modes with ***Freq*** ≥ 6 or in ***Pressure Support*** mode with apnea ventilation deactivated: Warning = ***PAW*** did not exceed the pressure threshold value for a duration of >30 seconds. In the ***ManSpont***, ***SIMV/PS*** modes with ***Freq*** < 6 or in ***Pressure Support*** mode with apnea ventilation activated: Warning = ***PAW*** did not exceed the pressure threshold value for a duration of >60 seconds	
		Breathing/ventilation stopped.	Check ventilator.
		Leakage or disconnection in the breathing system.	Check breathing system.
(20)	***APNOEA VENTILATION !!***	Breathing/ventilation stopped.	Check ventilator.
		Leakage or disconnection in the breathing system.	Check breathing system.
		If two or more successive breaths of the apnea ventilation are automatically triggered, the settings for ***Pressure Support*** are not correct.	Fabius detects a spontaneous breath of the patient. Check settings for ***Pressure Support***.
(7)	***BATTERY LOW !***	No mains power and battery <20 %	Restore mains power supply.
(17)	***BATTERY LOW !!***	No mains power and battery <10 %	Restore mains power supply.

Alarm priority	Alarm	Cause	Remedy
(26)	***CHECK APL VALVE !!!***	Fault in APL bypass valve.	Check membrane of the ventilator and close cover. Check the connection of the APL bypass valve and for leakage. Select ***Standby*** mode and then switch to the previous ventilation mode. Check APL valve setting.
(7)	***CHECK BATTERY !***	The backup power is 0 % of the full charge.	Replace fuse. Contact DrägerService or the authorized local service partner.
(31)	***CONTINUOUS PRESSURE !!!***	Airway pressure above threshold value for more than 15 seconds.	Check breathing system. Check fresh-gas flow in mode ***ManSpont***. Check the set limit value ▼ for the pressure threshold value.
(5)	***EXP PORT LEAKAGE !!***	In mode ***Volume Control***, ***Pressure Control***, or ***Pressure Support*** an expiratory flow of more than 15 mL was measured during the inspiration.	Check expiratory valve and valve disk. Check hose line of the expiratory control line. Check flow sensor. Perform the procedure for calibration of the flow sensor (see page 127). Contact DrägerService or the authorized local service partner.
(16)	***EXP PRESSURE HI !!***	In an automatic ventilation mode ***PEEP*** is more than 4 cmH_2O (hPa) above the setting for ***PEEP***.	Check PEEP/PMAX hoses and other hoses for kinks.
(4)	***FLOW SENSOR CAL DUE !***	More than 18 hours have passed since the last sensor calibration. The cable was removed and reconnected.	Perform the procedure for calibration of the flow sensor (see page 127).

Alarm priority	Alarm	Cause	Remedy
(8)	***FLOW SENSOR FAIL !***	Sensor cable is not connected.	Reconnect the sensor cable to the sensor of the breathing system.
		The flow sensor was not correctly calibrated. Sensor error.	Perform the procedure for calibration of the flow sensor (see page 127). Replace sensor and calibrate. Contact DrägerService or the authorized local service partner.
(21)	***FRESH GAS LOW !!***	Insufficient fresh-gas supply in all ventilation modes.	Ensure sufficient fresh-gas supply.
		Hose blocked/kinked.	Check hoses.
		Leakage or disconnection in the breathing system.	Check breathing system.
(13)	***INSP O_2 HIGH !!***	Inspiratory O_2 concentration is above the upper alarm limit.	Check the setting of the flow control valve and upper O_2 alarm limit.
(31)	***INSP O_2 LOW !!!***	Inspiratory O_2 concentration is below the lower alarm limit.	Check O_2 supply. Check the setting of the flow control valve and lower O_2 alarm limit.
(11)	***INSP PRES NOT REACH !!***	The plateau pressure during ventilation in ***Pressure Control***, ***Pressure Support***, or ***SIMV/PS*** mode is more than 3 cmH_2O (hPa) below the ***PINSP*** setting and the expected ***PLAT*** value.	Check the ventilator settings, patient circuit and settings for ***PINSP***.
(14)	***MINUTE VOLUME HIGH !!***	The minute volume has exceeded the upper alarm limit.	
		The flow sensor was not calibrated.	Calibrate the flow sensor (see page 127).
		Sensor error.	If necessary, replace the flow sensor.

Alarm priority	Alarm	Cause	Remedy
(22)	***MINUTE VOLUME LOW !!***	The minute volume is below the lower alarm limit.	Check the breathing system and alarm limit.
		Hose blocked/kinked.	Check breathing system.
		Leakage in breathing system.	Check breathing system.
		Reduced volume due to pressure limitation.	Check setting for ***PMAX***.
		Reduced lung compliance.	Check ventilator settings.
		Flow sensor not calibrated or faulty.	Perform the procedure for calibration of the flow sensor (see page 127). Replace sensor and calibrate.
(31)	***NO FRESH GAS !!!***	Insufficient fresh-gas supply.	Ensure sufficient fresh-gas supply.
		Valve for fresh-gas delivery is closed. Underpressure safety valve is automatically opened.	Open valve for fresh-gas delivery.
(6)	***O2 SENSOR CAL DUE !***	More than 18 hours have passed since the last O2 sensor calibration.	Perform the procedure for calibration of the O2 sensor (see page 127).
(8)	***O2 SENSOR FAIL !***	The O2 sensor was not correctly calibrated.	Perform the procedure for calibration of the O2 sensor (see page 127).
		O2 sensor replaced and/ or not calibrated.	Perform the procedure for calibration of the O2 sensor (see page 127).
		O2 sensor used up.	Replace sensor capsule and calibrate.
		O2 sensor not connected. Sensor cable faulty.	Connect O2 sensor unit. Replace O2 sensor housing unit.
(30)	***O2 SUPPLY LOW !!!***	The value for the O2 supply line has dropped below the permissible minimum pressure (approx. 20 psi) (approx. 1.4 kPa x 100).	Check O2 supply and backup cylinder.
(9)	***PEEP HIGH !***	In ***ManSpont*** mode, ***PEEP*** is above 8 cmH2O (hPa).	Check APL valve setting and/or fresh-gas flow.

Alarm priority	Alarm	Cause	Remedy
(7)	***POWER FAIL !***	Fabius not connected to mains power. General power failure.	Plug in the mains plug.
(1)	***PRES APNOEA ALARM OFF !***	Pressure alarm messages are deactivated in mode ***ManSpont***.	Activate the pressure alarm messages.
(2)	***PRES THRESHOLD LOW !***	The ventilation parameters are modified without changing the alarm settings (see chapter "Changing the alarm limits" on page 134).	Press ***AutoSet*** softkey and check ventilator settings.
(9)	***PRESSURE LIMITING !*** (Mode ***Volume Control***)	The measured pressure is the same as the ventilator setting for ***PMAX*** or exceeds it.	Check the ventilator settings and settings for ***PMAX***.
(25)	***PRESSURE NEGATIVE !!!***	The measured ***PAW*** value is ≤6.5 cmH_2O (hPa).	Check the breathing system and ventilator settings.
(8)	***PRESSURE SENSOR FAIL !***	Sensor faulty or pressure not calibrated.	Contact DrägerService or the authorized local service partner.
(1)	***RS232 COM1 FAIL !***	External monitor cable not connected with external communication connector 1.	Check connection cable of the monitor.
(1)	***RS232 COM2 FAIL !***	External monitor cable not connected with external communication connector 2.	Check connection cable of the monitor.
(1)	***SPEAKER FAIL !***	Speaker is not ready for operation.	Contact DrägerService or the authorized local service partner.
(28)	***VENTILATOR FAIL !!!***	Ventilator not mounted correctly.	Check membrane and close cover. Check whether the PEEP/PMAX line is connected and without leakage. Select ***Standby*** mode and then switch to the previous ventilation mode.
(1)	***VOLUME ALARMS OFF !***	Volume alarms deactivated by user.	Reactivate the volume alarms.

Cleaning, disinfection and sterilization

Disassembly

Observe before disassembling

- Switch off the device and accessory devices and remove their mains plugs.

Sequence of disassembly

1 Unscrew the sample line and dispose of.

2 Remove the flow sensor cable.

3 Remove the O_2 sensor and the O_2 sensor cable.

4 Remove the pressure measurement hose.

5 Remove the APL bypass hose and the PEEP/P_{MAX} hose.

6 Remove the water trap.

7 Disassemble the CO_2 absorber:
- CLIC absorber (disposable) or
- Reusable CO_2 absorber:
  - Unscrew the CO_2 absorber from the breathing system.
  - Remove and dispose of the soda lime dust filter (optional).
  - Empty the CO_2 absorber.
  - Remove the absorber insert from the absorber container. Leave the inner and outer sealing rings on the absorber insert.

8 Remove the breathing bag.

9 Disassemble the breathing circuit and the filters.

10 Unscrew the holder for the breathing bag.

11 Remove the compact breathing system:
- Remove the breathing system cover (optional).
- Remove the inspiratory valve.
- Remove the expiratory valve.
- Unscrew the exhaust port.
- Unscrew the inspiratory port and the expiratory port.
- Remove the flow sensor.
- Unscrew the APL valve.

WARNING

Risk of damage to breathing system

If the APL valve is not disassembled before the breathing system is reprocessed, this can lead to leakages in the breathing system.

Always remove the APL valve prior to reprocessing.

CAUTION

Risk of injury due to breathing system heating

When the breathing system heating is switched on, the bottom side of the compact breathing system and the heating plate beneath it can become hot.

Allow the breathing system to cool off before removing.

12 Remove the ventilator parts.

NOTE

To prevent accidental penetration of soda lime into the breathing system, do not transport the breathing system with a filled reusable CO_2 absorber.

Information concerning dismounted accessory parts and attached devices

Observe the instructions for use of the following accessory parts:

Accessory parts

– Flow sensor
– CLIC adapter
– CLIC absorber, Infinity ID CLIC absorber
– Breathing hoses
– Filter
– Breathing bag
– Masks
– Water trap
– Vaporizer

Attached devices

– Endotracheal suction
– Hinged arms
– Monitors
– Sensors and cables
– IT systems
– AGS
– workstation illumination

Single-use articles without instructions for use

– Soda lime dust filter (optional)
– Sample line

WARNING

Risk of infection

Used sample lines may be infectious due to the breathing gases that passed through them.

Replace the sample lines regularly, see table "Semi-critical medical devices".

CAUTION

Material damage due to disinfectants

When the sample line is disinfected and residues of the agent remain in the sample line, these residues can get into the water trap and the gas measurement module later. This may result in faulty measurements.

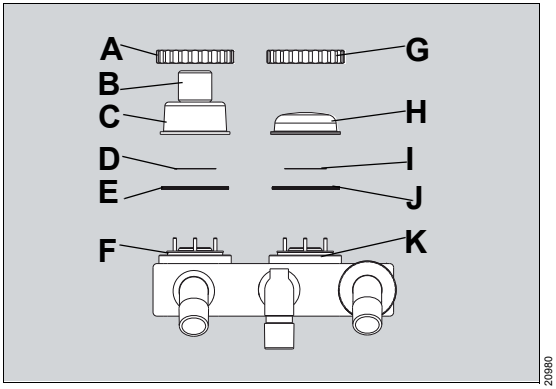
Sample lines are single-use items and may not be disinfected.

Removing the compact breathing system

Before removing the compact breathing system, the following hoses and cables must be removed:

– Flow sensor cable
– O_2 sensor cable and O_2 sensor capsule
– Pressure measurement hose
– APL bypass hose
– PEEP/PMAX hose

Removing the inspiratory valve



1 Remove the valve cover plug (B) or the O_2 sensor from the dome (C) of the inspiratory valve.

2 Screw off the cap nut (A).

3 Remove the dome (C).

4 Take out the valve plate (D).

5 Remove the sealing ring (E) from the socket (F).

Removing the expiratory valve

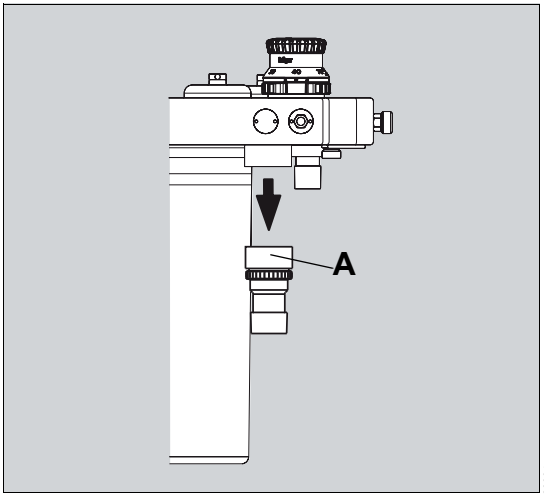
1 Screw off the cap nut (G).

2 Remove the sight glass (H).

3 Take out the valve plate (I).

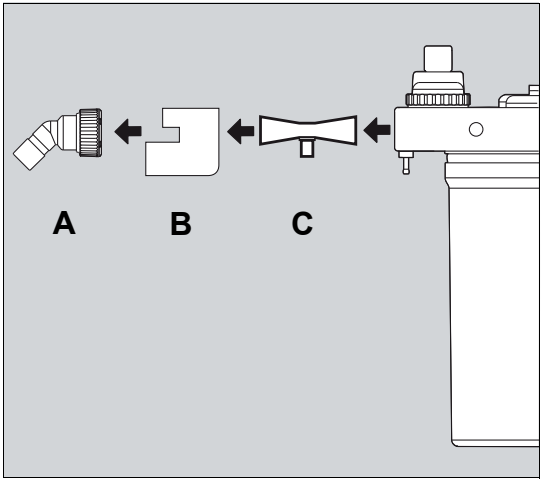
4 Remove the sealing ring (J) from the socket (K).

Removing the exhaust port



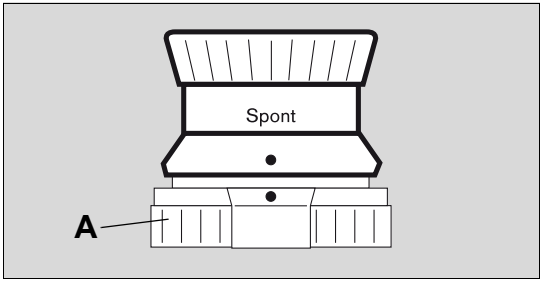
- Screw off the exhaust port (A).

Removing the flow sensor



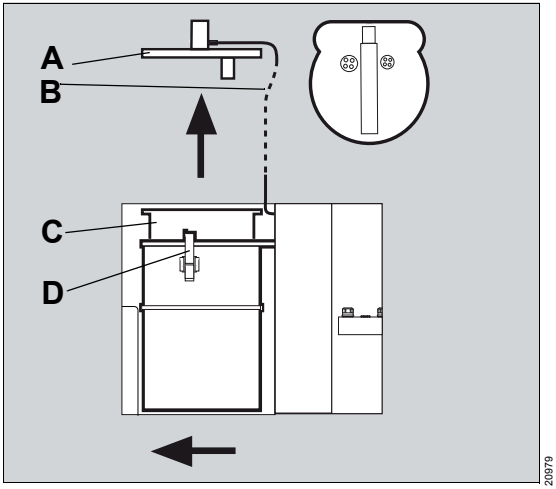
1 Loosen the expiratory port (A) and remove.
2 Remove the flow-sensor guard (B).
3 Remove the flow sensor (C).

Removing the APL valve



1 Loosen the knurled nut (A).
2 Remove the valve.

Removing the ventilator parts



1 Open the ventilator door.
2 Remove the pressure sensor line (B) of the ventilator chamber from the corresponding connection.
3 Release the 3 clamps (D).
4 Remove the cover (A).
5 Remove the ventilator membrane (C).

Removing the anesthetic gas receiving system

To disassemble, follow the steps in reverse order as listed in chapter "Connecting the anesthetic gas receiving system (optional)" on page 61.

Removing the endotracheal suction system

- Remove the suction regulator and suction bottle, see the associated instructions for use.

WARNING

Risk of infection

The contents of the suction bottle can be highly infectious.
– When emptying the suction container, wear protective gloves.
– Follow the hospital hygiene regulations.

Reprocessing procedures

WARNING

Risk of infection

Use validated reprocessing procedures when reprocessing the device and accessories.

Classification of medical devices

For reprocessing, the medical devices and their components are classified according to their type of application and the resulting risks:

– Non-critical medical devices: Surfaces accessible to the user and patient, e.g., device surfaces, cables
– Semi-critical medical devices: parts conducting breathing gas, e.g., breathing hoses, masks

Testing of procedures and agents

The cleaning, disinfection, and sterilization of medical devices were tested using the following procedures and agents. The following agents showed good material compatibility and effectiveness at the time of the test:

Non-critical medical devices

Manual disinfection with simultaneous cleaning:

– Incidin Extra N from Ecolab
– Incidur from Ecolab

Semi-critical medical devices

Manual cleaning:

– Neodisher FA, Neodisher Medizym from Dr. Weigert

Manual disinfection:

– Korsolex extra from Bode Chemie
– Gigasept FF from Schülke & Mayr

Machine cleaning:

– Neodisher FA, Neodisher Medizym from Dr. Weigert

Machine disinfection:

– Thermal, 93 °C (199.4 °F) for 10 minutes

Sterilization:

– Hot steam, 134 °C (273.2 °F) for 5 minutes

Non-critical medical devices

Manual disinfection with simultaneous cleaning

When selecting a suitable disinfectant, adhere to the country-specific lists of disinfectants. The list of the German Association for Applied Hygiene (Verbund für Angewandte Hygiene VAH) applies in German-speaking countries.
Strictly observe the manufacturer's specifications on the disinfectants. Manufacturers may change the composition of disinfectants over time.

Procedures:

1 Remove soiling immediately with a cloth soaked in disinfectant.

WARNING

Risk of electric shock or device malfunction

Liquid that enters into the device can cause the device to malfunction or may damage the device and endanger the patient.

Only scrub-and-wipe-disinfect device surfaces and cables and make sure no liquids penetrate into the device.

2 Perform surface disinfection by scrubbing and wiping.

3 Remove disinfectant residues after the contact time has elapsed.

Semi-critical medical devices

Manual cleaning

Perform manual cleaning preferably under flowing water and with commercially available cleaning agent (pH value ≤ 12).

Procedures:

1 Wash off surface soiling under flowing water.

2 Use cleaning agents in accordance with manufacturer’s specifications. Make sure that all surfaces and interior spaces to be cleaned can be reached. Use suitable brushes if necessary.

3 Thoroughly rinse components under running water until cleaning agent residues are no longer discernible.

4 Inspect components for visible soiling and damage. Repeat manual cleaning if necessary.

Manual disinfection

When selecting a suitable disinfectant, adhere to the country-specific lists of disinfectants. The list of the German Association for Applied Hygiene (Verbund für Angewandte Hygiene VAH) applies in German-speaking countries.

Strictly observe the manufacturer's specifications on the disinfectants. Manufacturers may change the composition of disinfectants over time.

Procedures:

1 Disinfect components by immersing.

2 After the contact time has elapsed, rinse the components thoroughly under running water until disinfectant residues are no longer discernible.

3 Inspect components for visible soiling and damage. Repeat manual disinfection if necessary.

4 Shake off all excess water. Allow components to dry thoroughly.

Machine cleaning and disinfection

Perform machine cleaning and disinfection with a washer-disinfector in accordance with EN ISO 15883, preferably with a cart for anesthesia accessories and ventilation accessories.

Procedures:

1 Strictly observe the instructions for use of the washer-disinfector.

2 Position the parts in the basket in a stable position. Make sure that all interior spaces and surfaces are completely flushed and water can drain off freely.

3 Use a suitable cleaning agent.

4 Select a suitable program, preferably anesthesia program.
   – Cleaning must be performed at 40 °C to 60 °C (104 °F to 140 °F) for at least 5 minutes.
   – Thermal disinfection must be performed at 80 °C to 95 °C (176 °F to 203 °F) and with corresponding contact time.

5 Carry out final rinsing with demineralized water.

6 Immediately remove the components from washer-disinfector.

7 Inspect components for visible soiling and damage. If necessary, repeat the program or perform manual cleaning or manual disinfection.

8 Allow components to dry thoroughly.

WARNING

Risk of device failure

If the control areas located in the valve plate are not sufficiently dried, this may compromise the device function or may lead to failure of the medical device.

After cleaning, the breathing system must be sterilized with steam until it is completely dry.

Visual inspection

Check all parts for damage and external wear such as cracking, brittleness or severe hardening, and remnants of contamination.

CAUTION

Risk from faulty accessories

Even reusable accessories have a limited maximum period of use, e.g., residues from disinfectants can attack the material in the autoclave. Signs of external wear can show up, e.g., cracks, deformation, discoloration, or delamination).

If signs of external wear occur, replace the affected accessory.

CAUTION

Risk of failure of flow measurement

Improper reprocessing and soiling, such as deposits 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.

WARNING

Risk of fire

Residual vapors of easily flammable disinfectants (e.g., alcohols) and deposits that were not removed during reprocessing can ignite when the flow sensor is in use.

- **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.**

Sterilization

Sterilization eliminates living microorganisms from semicritical medical devices and dries residual water in the interior of components.

- Sterilize only components that have been cleaned and disinfected.

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

Reprocessing list

Applicable to non-infectious patients.

The reprocessing list contains guiding values only. The instructions of the hospital's infection control officer take precedence.

Non-critical medical devices

Components which can be reprocessed	**Recommended reprocessing intervals**	**Manual**	
		Cleaning	**Disinfection**
Control elements and device surfaces including: – Screen – Softkeys – Rotary knob – O_2 flush key – Flow control valves – APL valve – Writing tray – Grip bar on trolley – Drawer handles – Standard rails on both sides – Clic adapter, Clic absorber	After each patient	Outside	Outside

Components which can be reprocessed	**Recommended reprocessing intervals**	**Manual**	
		Cleaning	**Disinfection**

Other surfaces which are frequently touched:
– Side parts of the housings of the screen and of other patient monitors
– Accessory parts:
  – Storage trays
  – Shelf
  – Hinged arms
  – Probes of compressed gas hoses
  – Mains plug
  – Gas cylinder valves
  – Transfer hose of the anesthetic gas receiving system
  – Cables and hoses that lie on floor
  – Brake
	Daily	Outside	Outside

Surfaces which are touched less frequently: – Network cables and data cables – Compressed gas hoses – Pressure reducers – Gas cylinders – Drawer surfaces, outside and inside – Anesthetic gas receiving system – Lamp – Holder for sample line	Weekly	Outside	Outside

Semi-critical medical devices

Components which can be reprocessed	Recommended reprocessing intervals	Preliminary cleaning	Machine cleaning and disinfection	Manual		Sterilization
				Cleaning	Disinfection	
Breathing system: – Breathing system housing – Inspiratory/expiratory ports, APL valve – Inspiratory valve, expiratory valve – Bag elbow – Rigid arm for breathing bag (optional) – Flexible arm for breathing bag (optional)	Weekly	Yes	Yes	Possible	Possible	Possible
– Breathing hoses	After each patient	Observe the associated instructions for use.				
Absorber container and absorber insert	Weekly	Yes	Yes	Possible	Possible	Possible
Soda lime dust filter (optional)	Replace each time soda lime is changed.	No	No	No	No	No
Sample line	Replacement only	No	No	No	No	No
– When the sample line is fitted to the filter on the Y-piece.	Daily					
– When the sample line is fitted directly to the Y-piece and the filters are fitted on the breathing system	After each patient					
Ventilator lid	After each patient	Yes	Yes	No	Yes	Yes
Ventilator membrane	After each patient	Yes	Yes	No	Yes	Yes

Components which can be reprocessed	Recommended reprocessing intervals	Prelimi-nary cleaning	Machine cleaning and disinfection	Manual		Steriliza-tion
				Cleaning	Disinfec-tion	
Ventilator hose	After each patient	Observe the associated instructions for use.				
Flow sensor	Weekly	Observe the associated instructions for use.				

Before using on patients again

1 Assemble the device components, see "Assembly and preparation" on page 52.

2 Mount the parts in the reverse oder of the disassembly, see "Disassembly" on page 162.

3 Check readiness for operation, see "Checking the readiness for operation" on page 85.

Maintenance

Overview

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

WARNING

Risk of infection

The responsible personnel may be infected by pathogenic germs.

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

WARNING

Risk of electric shock

There are conducting components under the housing cover.
- **Do not remove the housing cover.**
- **Maintenance measures must be performed by the personnel responsible. Dräger recommends DrägerService for repairs and complex maintenance tasks.**

WARNING

Risk of fire

When replacing the battery, short-circuits or excessive temperatures can occur, resulting in fire or explosion.

The battery must only be replaced by experts.

Definitions of maintenance terms

Term	Definition
Maintenance	All measures (inspection, preventive maintenance, repair) intended to maintain and restore the functional condition of a medical device
Inspection	Measures intended to determine and assess the actual state of a medical device
Service	Recurrent specified measures intended to maintain the functional condition of a medical device
Repair	Measures intended to restore the functional condition of a medical device after a device malfunction

Inspection

Inspections must be carried out regularly according to the following guidelines and within the specified intervals. Technical documentation is available on request.

Checks	Interval	Responsible personnel
Inspection and safety checks[1)]	Every 6 months	Experts

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

Safety checks

The safety checks are no substitute for service measures indicated by the manufacturer, including the preventive replacement of wearing parts.

WARNING

Risk of malfunction of the medical device

If the safety checks are not regularly performed, the medical device might not function properly.

Perform the safety checks in the specified intervals.

1 Check the accompanying documents:
- Latest instructions for use are available

2 Check the following functions according to the instructions for use:
- Check the proper function of the flow measurement.
- Check the function of the pressure measurement based on parameters ***PAW***, ***PEEP***, ***PMAX***.
- Check the proper function of the O_2 measurement
- Check the function of the anesthetic vaporizer according to the associated instructions for use.
- Check the function of the O_2 flush.
- Check the function of the pressure reducer (optional) of the compressed gas cylinder.

3 Check if the product is in good condition:
- Labels are complete and legible
- No visible damage
- Fuses which are accessible from the outside are in compliance with the specified values
- Country-specific labeling of gas types

4 Check components and accessories for completeness according to the instructions for use.

5 Check for electrical safety in compliance with IEC 62353.

6 Check safety features:
- Check the functional state of the optical and acoustic alarm generators.
- Check the functional state of the O_2 failure alarm.
- Check the locking device of the anesthetic vaporizer.
- Check the function of the power failure alarm and the battery function.
- Check S-ORC functionality.

Service

WARNING

Risk of faulty components

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

To maintain the function of all components, this device must be inspected and serviced at the intervals specified by the manufacturer.

WARNING

Risk of electric shock

Before performing any service work, disconnect all electrical connections and gas connections from power and gas supplies.

The following table shows the service intervals:

Component	Interval	Measure	Responsible personnel
CO_2 absorber	If colored violet	Replace	Users
Water trap	As needed or if soiled	Replace	Users
Flow sensor	As needed or if calibration is no longer possible	Clean/replace	Users
Internal lithium battery	Every 36 months	Replace	Experts
Fabius Tiro	Every 6 months	Inspection and service	Experts
Breathing system	Every 6 months	Inspection and service	Service personnel
Vaporizers	Every 6 months	Inspection and service	Service personnel
Sensors	Every 6 months	Inspection and service	Service personnel
Lead-gel battery	Every 3 years	Replace	Experts
Cylinder pressure reducer for high-pressure cylinders[1)]	After 6 years	Basic overhauling	Experts
Pressure reducer for PIN index[1)]	After 6 years	Replace	Experts

1) optional

Repair

For repairs, Dräger recommends DrägerService and the use of original Dräger parts.

Disposal

Disposing of the medical device

WARNING

Risk of infection

The device and its components must be disinfected and cleaned before disposal!

At the end of its service life:

- Have the medical device appropriately disposed of in accordance with applicable laws and regulations.

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

This device is subject to EU Directive 2002/96/EC (WEEE). In order to comply with its registration according to this directive, this device may not be disposed of at municipal collection points for waste electrical and electronic equipment. Dräger has authorized a company to collect and dispose of this device. To initiate collection or for further information, visit Dräger on the Internet at www.draeger.com. Use the search function with the keyword "WEEE" to find the relevant information. If access to the Dräger website is not possible, contact the local Dräger organization.

Disposal of accessories

When disposing of the following accessory parts, observe the hospital hygiene regulations and the respective instructions for use:

– Flow sensor
– Breathing hoses
– Filter, HME, HMEF
– Breathing bag
– Masks
– Water trap
– CLIC absorber, Infinity ID CLIC absorber
– Soda lime

Dispose on the following articles according to hospital hygiene regulations:

– Sample line
– Soda lime dust filter
– Anesthetic gas receiving system

Disposal of non-rechargeable batteries

WARNING

Risk of explosion and chemical burns

Improper handling of batteries can result in explosions and chemical burns.
– Do not throw batteries in the fire.
– Do not force batteries open.

- Do not recharge batteries.

The following applies to the Federal Republic of Germany: According to the battery law, the end user is obligated to return batteries containing toxic material to the distributor or the public waste management organization. The battery used in this device must therefore be removed by experts prior to disposal of the device. In countries other than Germany the respective national regulations must be complied with.

Technical data

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

All specified tolerances apply for 20 °C (68 °F), 60 % relative humidity, and 1013 hPa (760 mmHg).

The accuracies indicated below change according to atmospheric pressure, temperature, and relative humidity. If one of the ambient conditions is changed up to the permissible limit, the accuracy of the corresponding value can change by up to 50 %.If more than one of the ambient conditions are changed, the accuracy may change by up to 100 %.Example: Accuracy of a pressure measurement value: ±4 % at standard conditions. At 10 °C, the accuracy changes to ±6 %; at 10 °C and 20 % relative humidity, to ±8 %.

All patient-related volumes and flow values are normalized to the conditions in the lungs. (BTPS)

Ambient conditions

During operation	
Temperature	10 to 35 °C (50 to 95 ?)
Air pressure	700 to 1060 cmH_2O (hPa)
Relative humidity	20 to 80 % (without condensation)
Height	Up to 3000 m (9843 ft)
During storage and transport	
Temperature	-10 to 60 °C (14 to 140 °F)
Air pressure	700 to 1060 cmH_2O (hPa)
Relative humidity	10 to 90 % (without condensation)

The conditions for use when using additional devices can limit the environment of use of a system as a whole. Vaporizers and anesthetic agents can limit the use of an anesthesia workstation with regard to its temperature range and maximum fresh-gas flow. Therefore when using additional devices, follow the associated instructions for use.

Device data

Medical gas supply through central gas supply

Pressure range on device connection	
O_2, N_2O, Air	41 to 87 psi (2.8 to 6 kPa x 100)
	Note: Pressure fluctuations in the central gas supply must not exceed ±10%
Gas supply connection	NIST or DISS (if required)
(Every gas inlet is equipped with a non-return valve)	
Accuracy of the pressure displays	±3 % within the measurement range from 40 to 120 psi (2.7 to 8.3 kPa x 100)

Medical gas supply from O_2 and N_2O cylinders

(with NIST scew connections)

Pressure at the device connection	
O_2, N_2O	73 psi (5 kPa x 100)
(Every gas inlet is equipped with a non-return valve)	

Medical gas supply from O_2, O_2 and N_2O or O_2 and Air cylinders

(with pin-index connections)

Cylinder connection	Pin-index hanger yokes (CGA V-1-1994)	
Gas cylinder pressure	O_2, Air	1900 psi (131 kPa x 100)
(normal full load at 21 °C, 70 °F)	N_2O	745 psi (51.3 kPa x 100)
Pressure gauge for gas cylinders	In accordance with ASME B40.1 grade B	
Pressure measurement range for gas cylinders	O_2	0 to 3000 psi (206.8 kPa x 100)
	N_2O	0 to 3000 psi (206.8 kPa x 100)
	Air	0 to 3000 psi (206.8 kPa x 100)

Medical gas supply at device inlet

Dew point	>5 °C (41 °F) at ambient temperature
Oil content	<0.1 mg/m
Particles	Dust-free air (filtered with pore size < 1 µm)

Opening pressure of the internal safety valve	70 psi (4.8 kPa x 100)
Protection class	
Device	I, in compliance with IEC 60601-1
Application parts, connections for breathing hoses	Type BF
Classification in compliance with Directive 93/42/EEC, Annex IX	II b
UMDNS Code Universal Medical Device Nomenclature System - nomenclature system for medical devices	10-134
GMDN Code Global Medical Device Nomenclature - worldwide nomenclature for medical devices	37710
Use of latex	Not made with natural rubber latex.
Penetration of liquids	IP20 in accordance with IEC 60529
Power supply	
The power rating cannot be configured, with optional Dräger power socket strip (see instructions for use of power socket strip for medical devices, 9038776)	100 to 240 VAC, 50/60 Hz, 2.3 A max
Internal battery	
Power rating	24 V; 3.5 Ah
Type	Closed, lead/acid, gel
Charge time	16 hours on mains power for full operating time
Backup time with fully charged battery	Minimum 45 minutes

Weight

Weight (Fabius as wall-mounted version)	
Basic device	30.0 kg (66.1 lb)
Compact breathing system	6.4 kg (14.1 lb)
Wall mount	12.3 kg (27.1 lb)
Total weight	48.7 kg (107.4 lb)
Weight (Fabius as trolley version)	
Basic device with two pin-index cylinder holders	37.2 kg (82.0 lb)
Compact breathing system	6.4 kg (14.1 lb)
Trolley	72.4 kg (159.6 lb)
Total weight	116.0 kg(256.0 lb)

Dimensions W x H x D

Trolley version without compact breathing system	57.9 x 136.1 x 62.7 cm (22.8 x 53.6 x 24.7 in)
Trolley version with compact breathing system[1)]	77.2 x 136.1 x 83.8 cm (30.4 x 53.6 x 33.0 in)
Wall-mounted version without compact breathing system	52.8 x 55.6 x 44.2 cm (20.8 x 21.9 x 17.4 in)
Wall mounted version with compact breathing system[1)]	72.1 x 55.6 x 77.5 cm (28.4 x 21.9 x 30.5 in)

1) Width varies depending on the position of the breathing system

Fuses

Main fuses	For 100 to 240 V power supply 2x T2.5AH 250 V IEC 60127-2/V Size: Length 20 mm, ø5 mm (glass 4.4 mm)
Battery fuse	1x T3.15AH 250 V IEC 60127-2/V Size: Length 20 mm, ø5 mm (glass 4.4 mm)

External fresh-gas outlet

Connection	22 mm outer taper / 15 mm inner taper (ISO)
Pressure limitation	Max. 80 cmH_2O (hPa) at 18 L/min
Fresh-gas flow	0 and 0.2 to 18 L/min

Electrical safety

In compliance with	UL 60601-1 IEC 60601-1 CAN/CSA C22.2 No. 601.1-M90

General safety standards for anesthesia workstations

Relevant standards

In addition to the standards listed here, this medical device meets various other standards, e.g., standards concerning special national requirements.

IEC 60601-1 2nd ed. Medical electrical equipment	Part 1: General requirements for safety
IEC 60601-1-2 Medical electrical equipment	Part 1-2: General requirements for safety, collateral standard: Electromagnetic compatibility – Requirements and tests
IEC 60601-1-4 Medical electrical equipment	Part 1-4 General requirements for safety, collateral standard: Programmable electrical medical systems
IEC 60601-1-8 Medical electrical equipment	Part 1-8: General requirements for safety, collateral standard: General requirements, tests, and guidance for alarm systems in medical electrical systems

Relevant standards (continued)

IEC 60601-2-13 Medical electrical equipment	Part 2-13: Particular requirements for the safety of anaesthetic systems
ISO 8835-2 Systems for inhalational anaesthesia	Part 2: Anaesthetic breathing systems
ISO 8835-3 Systems for inhalational anesthesia	Part 3: Transfer and receiving systems of active anesthetic gas scavenging systems
ISO 8835-4 Systems for inhalational anesthesia	Part 4: Anesthetic vapor delivery devices
ISO 8835-5 Systems for inhalational anesthesia	Part 5: Anesthetic ventilators
ISO 21647 Medical electrical equipment	Particular requirements for the basic safety and essential performance of respiratory gas monitors

The following also apply for devices manufactured from July 2014 on:

IEC 60601-1 3rd ed. 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 safety, collateral standard: Electromagnetic compatibility – Requirements and tests
IEC 60601-1-8	Part 1-8: General requirements for basic safety and essential performance – collateral standard: General requirements, tests, and guidance for alarm systems in medical equipment and medical electrical systems
ISO 80601-2-13 Medical electrical equipment	Part 2-13: Particular requirements for basic safety and essential performance of an anaesthetic workstation

Relevant standards (continued)

ISO 80601-2-55	Part 2-55: Particular requirements for basic safety and essential performance of respiratory gas monitors

Ventilator

In compliance with	ISO 80601-2-13

Control ranges

Pressure limitation (***PMAX***)	15 to 70 cmH2O (resolution: 1 cmH2O) (15 to 70 hPa (resolution: 1 hPa)) (setting must be at least 10 cmH2O (10 hPa) above ***PEEP***, in ***SIMV/PS*** mode, the ***PMAX*** setting must be greater than ***ΔPPS***+***PEEP***)
Tidal volume (***VT***)	20 to 1400 mL (resolution: 10 mL)
Tidal volume (***VT***)	20 to 1100 mL (resolution: 10 mL), in ***SIMV/PS*** mode
Respiratory rate (***Freq***)	4 to 60 bpm (resolution: 1 bpm) (4 to 60 1/min (resolution: 1/min))
Ratio of inspiratory time to expiratory time (***TI:TE***)	4:1 to 1:4
Inspiratory pause (***TIP:TI***)	0 % to 50 % (resolution: 1%)
Positive end-expiratory pressure (***PEEP***)	0 to 20 cmH2O (resolution: 1 cmH2O) (0 to 20 hPa (resolution: 1 hPa))
Inspiratory pressure (***PINSP***)	5 to 65 cmH2O (resolution: 1 cmH2O) (5 to 65 hPa (resolution: 1 hPa)) (setting must be at least 5 cmH2O (5 hPa) above ***PEEP***)
Inspiratory flow (***Insp Flow***)	10 to 75 L/min (resolution: 1 L/min) in ***Pressure Control*** mode 10 to 85 L/min (resolution: 1 L/min) in ***Pressure Support*** and ***SIMV/PS*** modes
Support pressure (***ΔPPS***)	3 to 20 cmH2O (resolution: 1 cmH2O) (3 to 20 hPa (resolution: 1 hPa)), in ***Pressure Support*** mode
Support pressure (***ΔPPS***)	3 to 20 cmH2O, OFF (resolution: 1 cmH2O) (3 to 20 hPa OFF (resolution: 1 hPa)), in ***SIMV/PS*** mode

Minimum respiratory rate for apnea ventilation (***Freq Min***)	3 to 20 bpm (resolution: 1 bpm) and OFF (3 to 20 1/min (resolution: 1/min) and OFF)
Trigger value (***Trigger***)	2 to 15 L/min (resolution: 1 L/min)
Inspiratory time (***TINSP***)	0.3 bis 4.0 sec.

Accuracy

Pressure limitation (***PMAX***)	±5 cmH_2O (±5 hPa) of the setting
Tidal volume (***VT***)	±5 % of the setting or 20 mL, depending on which value is higher (discharged to atmosphere, no compliance correction)
Respiratory rate (***Freq***)	±1 bpm (±1 1/min) of the setting or ±5 %, depending on which value is higher
Ratio of inspiratory time to expiratory time (***TI:TE***)	±5 % of the setting
Inspiratory pause (***TIP:TI***)	±25 % of the setting
Positive end-expiratory pressure (***PEEP***)	±2 cmH_2O (±2 hPa) or ±20 % of the setting, depending on which value is higher
Inspiratory pressure (***PINSP***)	±2 cmH_2O (±2 hPa) or ±20 % of the setting, depending on which value is higher

Overpressure safety valve	75 ±5 cmH_2O (75 ±5 hPa)
Underpressure safety valve (inlet valve for ambient air)	-7.5 to -9 cmH_2O (-7.5 to -9 hPa)
Minimum pressure limit	-9 cmH_2O (-9 hPa)
Measuring the system compliance	0.2 to 6.0 mL/cmH_2O (0.2 to 6.0 mL/hPa) ±0.2 mL/cmH_2O (±0.2 mL/hPa) or ±10 % of the actual compliance depending which value is higher

Anesthetic gas supply module

Fresh-gas flow indicators

O_2, N_2O, Air	Range and accuracy: 0.0 to 12.0 L/min ±10 % of the measured value or ±0.12 L/min, depending which value is higher, against atmospheric pressure of 14.7 psi (1.013 kPa x 100) at 20 °C (68 °F). Resolution: 0.1 L/min

Fresh-gas flow stability

O_2 and N_2O: ±10% of the setting at supply pressures of 41 to 87 psi (2.8 to 6 kPa x 100)
Air: ±10% of the setting at supply pressures of 50 to 55 psi (3.4 to 3.8 kPa x 100).
Outside the range of 50 to 55 psi (3.4 to 3.8 kPa x 100), the Air flow varies proportionally to the supply pressures.

Total flow tube

Range and accuracy	0 to 10 L/min ±10 % of the measurement range at standard temperature and standard pressure, calibrated with a gas mixture of 50% O_2 and 50% N_2O 0 to 10 L/min ±15% of the measurement range at standard temperature and standard pressure for all other gas mixtures
Resolution	0.5 L/min at 0.5 to 2 L/min 1.0 L/min at 2 to 10 L/min
O_2 flush	at 87 psi (6 kPa x 100): max. 75 L/min at 41 psi (2.8 kPa x 100): min. 25 L/min
Pressure limit of the common gas outlet	Maximum 13 psi (0.9 kPa x 100) ±5%

Flow tube for O_2 supplemental delivery (optional)

Connection	Stepped connection for use with hoses of different diameters
Flow	0 to 10 L/min
Accuracy	±5 % of the measurement range
Resolution	0.5 L/min

Vaporizer interface

The anesthesia workstation is equipped with an interlock system.

When removing the vaporizer, the connection is automatically closed and sealed.

The following vaporizers can be used:

– Dräger-Vapor for halothane
– Dräger-Vapor for enflurane
– Dräger-Vapor for isoflurane
– Dräger-Vapor for sevoflurane
– Datex-Ohmeda Devapor/D-Tec for desflurane
– Dräger D-Vapor

Technical data of the vaporizers are contained in the corresponding instructions for use.

Measured value or waveform		**Range**	**Resolution**	**Accuracy**	**Condition**
PAW	Airway pressure (numeric)	-20 to 99 cmH_2O (hPa)	1 cmH_2O (hPa)	±4 %[1)]	
	Airway pressure (waveform)	0 to 99 cmH_2O (hPa)			
	Pressure gauge (mechanical)	-20 to 80 cmH_2O (hPa)	2 cmH_2O (hPa)	1.28 cmH_2O (hPa)	
MVe	Expiratory minute volume	0 to 32.0 L/min	0.1 L/min	±15% or ±0.2 mL, depending on which value is higher[2)]	Based on 20 °C (68 °F) Ambient pressure and saturated gas
VTe	Expiratory tidal volume	0 to 1500 mL	1 mL	±15 %[2)] or ±20 mL, depending on which value is higher	

Measured value or waveform		Range	Resolution	Accuracy	Condition
Note: If the end-tidal desflurane concentration increases to above 12%, the measurement accuracy of the tidal volume and minute volume can deviate by more than 15%.					
Freq	Respiratory rate	2 to 99 bpm (1/min)	±1 bpm (1/min)	±1 bpm (±1 1/min) of the setting or ±5%, depending on which value is higher	
FiO_2	O_2 measurement in the mainstream	10 to 100 Vol%	1 Vol%	±2.5 Vol% +2.5 % of the measured values in accordance with ISO 21647 and ISO 80601-2-55	Based on the ambient pressure during calibration

1) Max. ±4 % of the measured value or ±2 cmH_2O (±2 hPa), depending on which value is higher.
2) With standard test conditions in accordance with ISO 80601-2-13.

O_2 sensor

Response time (T90)	Less than 16 seconds	Measured values are not pressure compensated.
Heat-up time	after 5 minutes	Error with ≤ 3% of the measured value
Drift sensitivity		±1 % of the measured value/ 8 h
Cross sensitivity		1 Vol% O_2 at 70 Vol% N_2O and 5 Vol% CO_2 With 4 Vol% halothane or with 5 Vol% enflurane or with 15 Vol% desflurane or with 5 Vol% isoflurane or with 10 Vol% sevoflurane
Measurement deviation due to humidity	Max. ±0.02% of the measured value per % relative humidity	
Maximum period of use of O_2 sensor cell	>12 months at 25 °C (77 °F), 50 % relative humidity, 50 % O_2 in fresh gas (or >5000 hours at 100 Vol% O_2)	

Breathing system

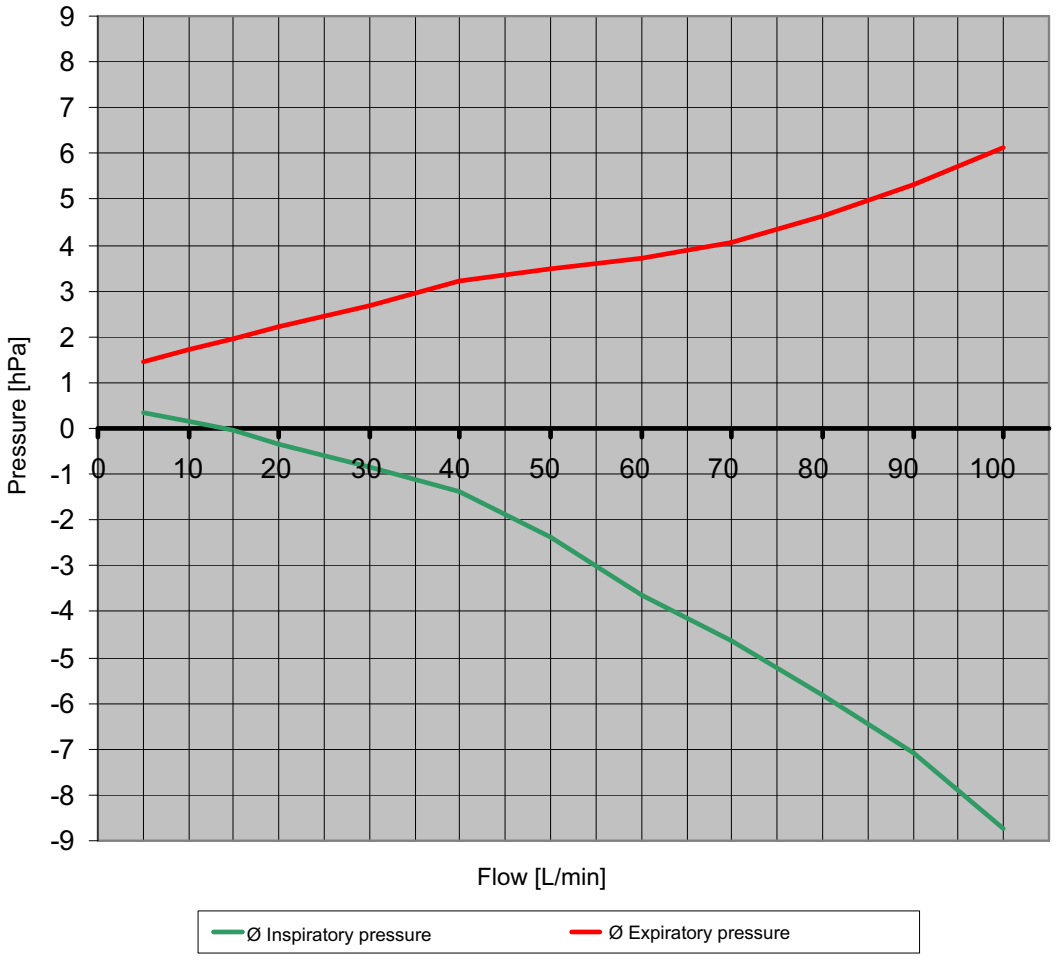
Volume with reusable CO_2 absorber (including absorber volume, measured in ManSpont)	
Filled, without hoses	typically 4000 mL + volume of the breathing bag
Volume with Drägersorb CLIC adapter (including absorber volume, measured in ManSpont)	
Filled, without hoses	typically 3700 mL + volume of the breathing bag
Absorber volume	
Reusable CO_2 absorber, filled	1500 mL
Disposable CO_2 absorber CLIC absorber Free	1200 mL
Disposable CO_2 absorber CLIC Absorber 800 Free	1200 mL
Compliance	
including ventilator hose (without breathing hoses)	0.8 mL/cmH_2O (0.8 mL/hPa)
Flexible arm for breathing bag (optional)	
Volume	0.13 L
Compliance	0.13 mL/cmH_2O (0.13 mL/hPa)
Rigid arm for breathing bag (optional)	
Volume	0.11 L
Compliance	0.11 mL/cmH_2O (0.11 mL/hPa)
Resistance	
In accordance with ISO 80601-2-13, dry, with adult breathing hose set M30146[1)]	Inspiratory: -4.7 cmH_2O (-4.7 hPa) Expiratory: 4.4 cmH_2O (4.4 hPa)
In accordance with ISO 80601-2-13, dry, without hoses[1)]	Inspiratory: -3.7 cmH_2O (-3.7 hPa) Expiratory: 3.7 cmH_2O (3.7 hPa)
Typical leakage	<50 mL/min

Control ranges

APL valve	
Manual ventilation mode	5 to 70 cmH_2O (hPa)
Spontaneous breathing mode	1.5 cmH_2O (hPa)
Accuracy from 5 to 15 L/min	±15 % of the set value or ±3 cmH_2O (hPa) (the higher value applies)
Pressure drop at 30 L/min	3.4 cmH_2O (hPa) (wet and dry)

1) Depending on the current ventilation settings, the indicated values may deviate by ±0.3 cmH_2O (0.3 hPa)

ISO 80601-2-13: Pressure/flow characteristics of the compact breathing system COSY 2.6 (average resistances without breathing hoses)



22229

Alarm for low oxygen supply pressure

Alarm limit	Warning signal (continuous tone 10 s, adjustable from approx. 56 dB(A) to 69 dB(A)) as soon as the pressure drops below 20 ±4 psi (1.4 ±0.3 kPa x 100).
Alarm priority	High priority (warning)
Optical alarm signal	The red LED next to the O_2 flow control valve flashes.

Alarm tone sequence IEC

Sound pressure level L(A) of the alarm tones at the workstation, measured in accordance with IEC 60601-1-8	
Alarm tone volume (high priority)	Settable from approximately 60 dB(A) to 73 dB(A)
Alarm tone volume (medium priority)	Settable from approximately 50 dB(A) to 63 dB(A)
Alarm tone volume (low priority)	Settable from approximately 50 dB(A) to 60 dB(A)

Characteristics of additional acoustic signals

Alarm in the event of failure of power supply and battery supply	Continuous tone (approx. 30 s) at approx. 61 dB(A)
Confirmation of selection using rotary knob	Single tone when rotary knob is pressed (approx. 52 dB(A) at max. alarm tone volume)
Time exceeded when changing ventilation mode	3 tones adjustable from 50 dB(A) to approx. 61 dB(A)
Selection of alarm volume	Single tone per level (corresponds to volume of alarm tone)

S-ORC (Sensitive Oxygen Ratio Controller)

At a flow of approx. 200 mL	Set the N_2O concentration in the fresh gas between 0 and 75 %.
In case of insufficient O_2	S-ORC limits the N_2O concentration in the fresh gas so that the O_2 concentration does not drop below 23 Vol%.
N_2O flow control valve is open and at the same time the O_2 flow control valve is closed or set at less than 0.2 L/min.	S-ORC prevents N_2O flow.
In case of N_2O failure	O_2 can continue to be supplied. No alarm.

Device outlets

Serial interfaces		COM 1 and COM 2 Only connect to 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 exposed secondary circuits with maximum 24 Vdc nominal voltage.
Protocol		Vitalink, MEDIBUS
Connector		9-pole Sub-D, galvanically isolated with 1.5 kV against internal electronics, 0.5 kV against housing
Baud rate		1200, 2400, 4800, 9600, 19200, 38400 baud
Data bits		7 or 8
Parity		Uneven, even, none
Startbit		1
Stopbit		1 or 2
Pin assignment		
	Pin 1	n/c
	Pin 2	TXD
	Pin 3	RXD
	Pin 4	n/c
	Pin 5	GND
	Pin 6	n/c
	Pin 7	n/c
	Pin 8	n/c
	Pin 9	n/c

Essential performance characteristics

The essential performance features comprise:

– Supplying 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.
– Monitoring of the airway pressure and the expiratory minute volume
  Alarms are issued depending on the set alarm limits.
– Measurement accuracy of the O_2 measurement.
  Alarms are issued depending on the set alarm limits. If the O_2 sensor fails, an alarm is issued.

NOTE

In accordance with general safety standards, additional components are required for a complete anesthesia workstation.

EMC declaration

General information

The EMC compliance of the product has been evaluated with the external cables, transducers, and accessories specified in the list of accessories. Other accessories which do not affect EMC compliance may be used if no other reasons forbid their use (see other sections of the instructions for use).The use of noncompliant accessories can result in increased emissions or decreased immunity of the medical device.

The medical device must only be used adjacent to or stacked with other devices if this configuration is approved by Dräger. If adjacent or stacked use of configurations not approved by Dräger is inevitable, verify correct functioning of the medical device in this configuration before it is used. In any case, strictly observe the instructions for use of the other devices.

Electromagnetic emissions

When using wireless networking, be aware that the system operates at 2.4 GHz range. Other equipment, even if compliant with CISPR emission requirements, can interfere with reception of wireless data. When selecting wireless systems (wireless communication media, pager systems, etc.) for use in installations where wireless networking is used, care must always be used to ensure that operating frequencies are compatible. For example, selecting wireless communication media that operate at 2.4 GHz will likely cause difficulty with the networking components. Low-level signals such as ECG signals are particular susceptible to interference from electromagnetic energy. Even if the equipment meets the test requirements described below, smooth operation cannot be guaranteed – the ‘quieter‘ the electrical environment the better. In general, increasing the distance between electrical devices decreases the likelihood of interference.

Detailed radio frequency characteristics

Communication devices in accordance with IEEE 802.11b:

– 2412 to 2472 MHz
– DSSS (direct-sequence spread spectrum) limited to 100 mW
– Applicable to access points and client adapters

Communication devices in accordance with IEEE 802.15.1:

– 2400 to 2485 MHz
– FHSS (frequency-hopping spread spectrum) limited to 2.5 mW

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

Electromagnetic environment

The medical device is intended for use in an electromagnetic environment as specified below. The user must ensure that the medical device is used in such an environment.

Emissions	**Compliance according to**	**Electromagnetic environment**
Radio frequency emissions (CISPR 11)	Group 1	The medical device uses radio frequency energy only for its internal function. Therefore, its radio frequency emissions are very low and are not likely to cause any interference in nearby electronic equipment.
	Class A	The medical device is suitable for use in all establishments other than domestic establishments and those directly connected (without transformer) to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions (IEC 61000-3-2)	Not applicable	
Voltage fluctuations/flicker emissions (IEC 61000-3-3)	Not applicable	

Electromagnetic immunity

The medical device is intended for use in an electromagnetic environment as specified below. The user must ensure that the medical device is used in such an environment.

Immunity against	**IEC 60601-1-2 test level**	**Compliance level (medical device)**	**Electromagnetic environment**
Electrostatic discharge (ESD) (IEC 61000-4-2)	Contact discharge: ±6 kV	±6 kV	Floors should be wood, concrete, or ceramic tiles. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
	Air discharge: ±8 kV	±8 kV	
Electrical fast transients/bursts (IEC 61000-4-4)	Power supply lines: ±2 kV	±2 kV	Mains voltage quality should be that of a typical commercial or hospital environment.
	Longer input lines/output lines: ±1 kV	±1 kV	
Surges (IEC 61000-4-5)	Common mode: ±2 kV	±2 kV	Mains voltage quality should be that of a typical commercial or hospital environment.
	Differential mode: ±1 kV	±1 kV	
Magnetic field with supply frequency (50/60 Hz) (IEC 61000-4-8)	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical commercial or hospital environment.
Voltage dips and short interruptions of supply voltage (IEC 61000-4-11)	Voltage dip >95 %, 0.5 periods	>95 %, 0.5 periods	Mains voltage quality should be that of a typical commercial or hospital environment. If the user of the medical device requires continued operation during mains power supply interruptions, it is recommended that the medical device is powered from an uninterruptible power supply or a battery.
	Voltage dip 60 %, 5 periods	60 %, 5 periods	
	Voltage dip 30 %, 25 periods	30 %, 25 periods	
	Voltage dip >95 %, 5 seconds	>95 %, 5 seconds	

Immunity against	**IEC 60601-1-2 test level**	**Compliance level (medical device)**	**Electromagnetic environment**
Radiated radio frequency disturbance (IEC 61000-4-3)	80 MHz to 2.5 GHz: 10 V/m	10 V/m	Recommended minimum distance to portable and mobile radio frequency transmitters with transmission power P_{EIRP} to the medical device including its lines:[1)] $1.84\ m \times \sqrt{P_{EIRP}\ [watts]}$ $(6.04\ ft \times \sqrt{P_{EIRP}\ [watts]})$
Conducted radio frequency disturbance (IEC 61000-4-6)	150 kHz to 80 MHz: 10 V inside ISM bands[2)]	10 V	Recommended minimum distance from portable and mobile radio frequency transmitters with transmission power P_{EIRP} to the medical device including its lines: [1)] $1.84\ m \times \sqrt{P_{EIRP}\ [watts]}$ $(6.04\ ft \times \sqrt{P_{EIRP}\ [watts]})$
	150 kHz to 80 MHz: 3 V outside ISM bands[2)]	3 V	

1) For P_{EIRP}, insert the highest possible "equivalent isotropic radiated power" of the adjacent radio frequency transmitter. In the vicinity of equipment marked with the symbol, interference can occur. Field strengths from fixed, portable, or mobile radio frequency transmitters at the location of the medical device should be less than 3 V/m in the frequency range from 150 kHz to 2.5 GHz and less than 1 V/m above 2.5 GHz.
2) ISM bands in this frequency range are: 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; 40.66 MHz to 40.70 MHz.

Recommended safety clearance for portable and mobile high-frequency communication equipment

The safety clearances listed in the following comply with IEC 60601-1-2.

Max. PEIRP (watts)	**150 kHz to 2.5 GHz**	**All other frequencies**	**Examples**
0.03	0.32 m (1.1 ft)	0.96 m (3.2 ft)	WLAN 5250 / 5775 (Europe)
0.10	0.58 m (1.9 ft)	1.8 m (5.9 ft)	WLAN 2440 (Europe)
0.17	0.76 m (2.5 ft)	2.3 m (7.6 ft)	Bluetooth, RFID 2.5 GHz
0.20	0.82 m (2.7 ft)	2.5 m (8.2 ft)	WLAN 5250 (not in Europe)
0.25	0.92 m (3.0 ft)	2.8 m (9.2 ft)	UMTS mobiles
0.41	1.2 m (3.9 ft)	3.5 m (12 ft)	Cordless DECT devices
0.82	1.7 m (5.6 ft)	5.0 m (16 ft)	RFID 13.56 MHz
1.00	1.8 m (5.9 ft)	5.5 m (18 ft)	WLAN 5600 (not in Europe)
1.64	2.4 m (7.9 ft)	7.1 m (23 ft)	GSM 1800 / GSM 1900
3.3	3.3 m (11 ft)	10 m (33 ft)	GSM 900 mobile phones, RFID 868 MHz

Reduced safety clearance for portable and mobile high-frequency communication equipment

The safety clearances listed in the following are the result of tests that Dräger has performed to determine the minimum necessary safety clearances. These reduced safety clearances apply only to mobile high-frequency communication equipment that uses the standards specified.

Mobile high-frequency communication equipment with ...	**Safety clearance**
GSM 850, GSM 900, RFID 868 MHz (limited to 2 W ERP)	0.30 m (12 in)
GSM 1800, GSM 1900 (limited to 1 W ERP)	0.30 m (12 in)
UMTS, DECT (limited to 0.25 W ERP)	0.15 m (6 in)
Bluetooth, WLAN 2450, RFID 2450 (limited to 0.1 W ERP)	0.30 m (12 in)

Device combinations

This device can be operated in combination with other Dräger devices or with devices from other manufacturers. Observe the accompanying documents of the individual devices.

If a device combination is not approved by Dräger, the safety and the functional state 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 (as applicable):

– IEC 60601-1, 3rd edition (general requirements for safety, device combinations, software-controlled functions)
  – IEC 60601-1-2 (electromagnetic compatibility)
  – IEC 60601-1-8 (alarm systems)

Or:

– IEC 60601-1, 2nd 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)

Connections to IT networks

Data can be exchanged in an IT network using hard-wired and wireless technologies. An IT network can be any data interface (e.g., RS232) that is described in standards and conventions.

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

– Display of waveforms and parameter data
– Signaling of alarms
– Service mode, access to logbooks

Information for connecting to an IT network

Prerequisites

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

The following documents must be followed:

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

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

Serial interfaces

The following interfaces are supported:

– RS232 interfaces complying with EIA RS--232 (CCITT V.24/V.28) for the following applications:
  – MEDIBUS, MEDIBUS.X
  – Connections to medical devices from other manufacturers

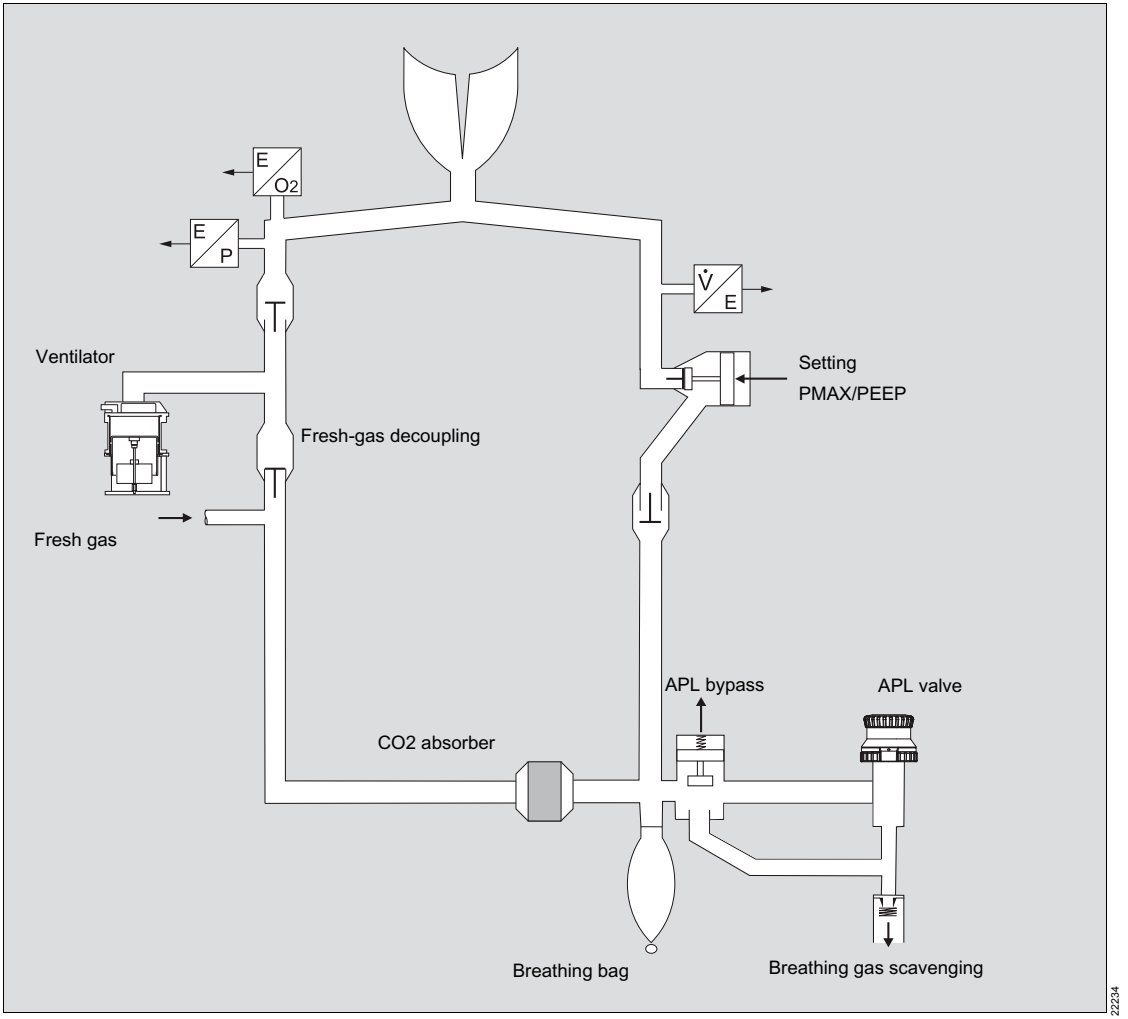
Electrical requirements of connected devices and networks

The serial port is only appropriate for connecting devices or networks that have a nominal voltage on the network side of max. 24 V DC and meet the requirements of one of the following standards:

– IEC 60950-1: Ungrounded SELV circuits
– IEC 60601-1 (2nd edition or later): Exposed secondary electrical circuits

Illustrations

Gas flow plan of the breathing system



Annex

Form for daily checkout and pre-use checkout

To ensure that Fabius is ready for operation, the following form must be filled in before start-up. After starting the check, no additional components may be added and and no changes may be made to the anesthesia workstation.

This is a recommendation. The checking guidelines of the respective healthcare facility must be followed.

CAUTION

If one of the checks does not pass, the device must not be used.

Contact DrägerService or the responsible service partner.

NOTE

The following applies to this section: cmH_2O = mbar = hPa.

Checklist

The checklist for daily checkout before using the medical device takes into consideration all possible configurations of Fabius. If a test point does not apply to the Fabius to be tested due to configuration deviations, skip the respective test point.

All checks must be performed daily before use of the device. Personnel who perform the checks must be fully familiar with the instructions for use.

P ❒ This test point must be performed before each patient change.

❒ Box to check if the test point passed.

Mark off the individual functions after successful check.

Make copies of these pages so that they can be used as a daily record for the device check.

Fabius Tiro
Part number:

Prerequisites

❒ The maintenance intervals of the device and accessories have not been exceeded.

P ❒ The device is completely assembled and connected.

❒ All monitoring functions (e.g., O_2 monitoring) and external monitors (e.g., breathing gas monitor) are switched on and functioning.

❒ The system test for Fabius has been performed.

P ❒ The sample line for gas monitoring (if present) is connected to the Luer Lock connection on the Y-piece.

P ❒ An appropriate anesthetic agent was selected.

P ❒ D-Vapor (if present) is switched on.

Battery

P ❒ Make sure that the battery is completely charged. (Battery operation of 45 minutes is only guaranteed with a completely charged battery.)

Gas supply

❒ Visually inspect the central gas supply and the gas cylinders. Connect all hoses. Make sure that the hoses are tightly connected.

❒ Make sure that the supply pressures of the central gas supply lie within the permissible range.

Gas cylinders

❒ Open the gas cylinders (if present).

❒ O_2 pressure is higher than 1000 psi (70 kPa x 100).

❒ N_2O pressure is higher than 600 psi (43 kPa x 100).

❒ Air pressure is higher than 1000 psi (70 kPa x 100).

❒ Close the gas cylinders.

O_2 flush

❒ Press O_2 flush key: Check whether a strong gas flow escapes from the patient connection on the Y-piece.

❒ Release O_2 flush key: Check whether the gas flow stops.

Fresh-gas delivery and S-ORC

❒ Activate the ***ManSpont*** mode.

❒ Open the O_2 flow control valve completely. Check whether the electronic O_2 fresh-gas flow display shows at least 10 L/min.

- ❒ Close the Air flow control valve. Open the N_2O flow control valve completely. Check whether the electronic N_2O fresh-gas flow display shows at least 10 L/min.
- ❒ Check whether the float of the total flow tube moves upward.
- ❒ Shut off O_2 supply:
  - Remove the O_2 connection of the central gas supply.
  - Close the O_2 cylinder valve.
  - Check whether the red LED for low O_2 supply pressure is flashing.
  - N_2O flow is interrupted.
- ❒ Check whether the float of the total flow tube shows 0 L/min.
- ❒ Restore O_2 supply:
  - N_2O flow is present.
- ❒ Set the O_2 flow control valve to 1.5 L/min.

  N_2O gas delivery = 3 L/min to 5 L/min.
- ❒ Close the O_2 flow control valve:
  - N_2O flow is interrupted.
- ❒ Open the Air flow control valve. Check whether the electronic Air fresh-gas flow display shows at least 10 L/min.

  Close all flow control valves.

Calibration of the sensors

- ❒ Remove the O_2 sensor housing from the cover of the inspiratory valve.
- ❒ Expose the O_2 sensor to ambient air for 2 minutes.
- ❒ Start the calibration.
- ❒ Reinsert the O_2 sensor housing to the cover of the inspiratory valve.
- ❒ Calibrate the flow sensor

Check type of gas

- ❒ Set the O_2 flow control valve to 3 L/min.
- ❒ Check whether the measured O_2 concentration is at approx. 90 to 100 Vol%.
- ❒ Close the O_2 flow control valve.

Vapor 19.n, Vapor 2000/3000 (Tec 5)

P ❒ Vaporizer is securely connected, locked, and is hanging vertically.

P ❒ Control dial is in position ***0***.

P ❒ Filling level is between the minimum mark and the maximum mark.

P ❒ Safety filling device:
  - Sealing block is inserted and closed tightly.
  - Filling inlet is locked.
  - Drainage valve closed.

P ❒ Filling device Quik Fil:
  - Drainage valve closed.
  - Sealing cap is tightly closed.

P ❒ Dräger Fill filling system:
  - Drainage valve closed.
  - Sealing cap is tightly closed.

D-Vapor (optional)

P ❒ Vaporizer is securely connected, locked and is hanging vertically.

P ❒ Control dial is in position ***0***.

P ❒ Filling level is between the minimum mark and maximum mark.

P ❒ Operation LED is lit.

Anesthetic vaporizers with Selectatec connection

P ❒ Vaporizer is securely connected, locked and is hanging vertically.

P ❒ Control dial is in position ***0***.

P ❒ Filling level is between the minimum mark and maximum mark.

Soda lime

P ❒ CO_2 absorber is attached to the device and sufficiently filled.

P ❒ Maximum 50 % are discolored.

Airway pressure sensor

Change to standby mode and start the leakage test.

❒ Close all flow control valves.

❒ Set the Y-piece on the circuit plug on the bag elbow for the breathing bag.

❒ If necessary, occlude the sample line.

❒ Remove the pressure measurement hose from the socket for the airway pressure sensor on the rear of the device.

❒ The pressure displayed in the leakage test is at "0". Up to ±2 is permissible. If the deviation is larger, contact DrägerService.

❒ Reconnect the pressure measurement hose to the socket for the airway pressure sensor on the rear of the device

Localizing leakages in the breathing circuit

The check must be performed once without vaporizer and once with vaporizer. Control dial is in the zero position.

D-Vapor must be switched on for the leakage test. After the leakage test has ended, switch off the D-Vapor again.

❒ Change to ***Standby*** mode and press the ***Leak / Compl Test*** softkey. Follow the instructions on the screen.

If the system has leakage (the pressure drops):

- Check all plug connections and screw connections for a tight seat.
- Replace missing or damaged seals. If necessary, contact DrägerService or the authorized local service partner

Inspiratory valve and expiratory valve

- Press the ***ManSpont*** key and confirm.
- Set the APL valve to position ***Man*** and to 30 cmH_2O (hPa).
- Press O_2 flush.

P ❒ The breathing bag fills.

P ❒ When the breathing bag is squeezed and released, the valve plates in the inspiratory valve and expiratory valve move.

APL valve

P ❒ Set the APL valve to position ***Man*** and to 30 cmH_2O (hPa). Set the fresh-gas flow to 20 L/min.

P ❒ Press the ***ManSpont*** key and confirm.

P ❒ When the pressure waveform has stabilized (e.g., in the shape of a flat line), set the APL valve to ***Spont*** to release the pressure.

P ❒ The displayed measured value for the peak pressure (***PEAK***) is between 24 to 36 cmH_2O (hPa).

Ventilator

P ❒ Connect the breathing bag to the Y-piece.

P ❒ Press the ***Pressure Control*** key and confirm.

P ❒ The measured values of the ventilation parameters are displayed.

P ❒ The ventilator piston functions.

P ❒ The valve plates in the inspiratory valve and expiratory valve move.

P ❒ The breathing bag fills and empties.

P ❒ Press the standby key and confirm.

Monitoring functions and alarms

The alarm function can be checked by setting an alarm limit that causes an alarm message for certain. The alarm limits can be adjusted at the start and during a check.

- ❒ Check the settings of the alarm limits.
- ❒ Simulate alarm conditions and check whether the correct alarm signals are triggered.
- ❒ Check O_2 display and alarm.
- ❒ Check volume display and alarm.
- ❒ Check pressure display and alarm.
- ❒ Press the standby key and confirm.

When Fabius is restarted, the default settings for the alarm limits are automatically restored.

- ❒ Check the default settings and adjust if necessary.

Other monitors (optional)

Make sure that external monitors (if present) are connected correctly and have been checked in accordance with the associated instructions for use.

- ❒ Test the alarm functions on all monitors.
- ❒ CO_2 monitor and alarm module are functional.
- ❒ Anesthetic agent monitor and alarm module are functional.

Anesthetic gas scavenging system

P ❒ Hoses are correctly connected.

P ❒ Set the flow control valve on the anesthetic gas receiving system so that the float is located between the "Min." and "Max." marks.

P ❒ Occlude the Y-piece. Close all flow control valves.

P ❒ Change to the ***Standby*** screen.

Set the APL valve for spontaneous breathing:

- Turn the APL valve head counterclockwise until the ***Spont*** mark is reached.
- Press the O_2 flush key and hold it pressed.
- The airway pressure with an occluded Y-piece is less than 10 cmH_2O (hPa).
- Release the O_2 flush key.
- The airway pressure is higher than or equals 0 cmH_2O (hPa).

Manual resuscitator

- ❒ When squeezing the bag an audible and noticeable air flow must escape from the mask connection (cone). After releasing, the bag must quickly assume its original shape.
- ❒ Close off the mask connection (cone) with the ball of the hand: The bag must only be able to be slightly squeezed.

COSY heating (optional)

- ❒ Check cable connections.
- ❒ Check power cable connections.
- ❒ LED indicator for power supply lights up.
- ❒ Toggle switch is set to ON.
- ❒ LED indicator for COSY heating lights up.

  30 minutes after the LED indicator for the COSY heating lights up, the temperature of the bottom of COSY is approx. 35-40 °C.

P ❒ **Before connecting to the patient**

– All vaporizers are switched off (the control dials are in the ***0*** position).

– The APL valve is set to the desired pressure.

– All electronic fresh-gas flow displays and the total flow tube indicate **0**.

- The scavenging flow of the endotracheal suction is present.
- The breathing system is ready for operation (the breathing bag is correctly positioned and all hoses are correctly connected).
- CO_2 absorber is attached to the device and sufficiently filled.

If any one of the test points is not passed, the device must not be used. Contact DrägerService or the authorized local service partner.

Signature for the daily checkout

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Date	

Signature for pre-use checkout

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Password

Configuration password for Fabius Tiro Software 3.n

Cut-out from the instructions for use of Fabius Tiro Software 3.n

To prevent unauthorized alteration, the start settings for Fabius Tiro are protected by the following configuration password:

8088

Information for the configuration password

To prevent unauthorized alteration, the default settings for Fabius Tiro are protected by a 4-digit password. For information on the start settings, see page 132.

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.

Upon request, DrägerService can customize the password or deactivate the password function.

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Index

D

E

F

G

I

L

M

N

O

P

R

S

T

V

These instructions for use only apply to
Fabius Tiro SW 3.n
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

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