WARNING: For a full understanding of the performance characteristics of this equipment, the user should carefully read this manual before operating.

Inhalation Anesthesia Machine
Software 3.n
Operating Instructions
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# Introduction

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Overview

Caution: For your safety and that of your patients, strictly follow this instruction manual.

Any use of the Fabius GS® requires full understanding and strict observation of these instructions. The unit is only to be used for purposes specified here.

Recommendations

Because of the sophisticated nature of Draeger Medical anesthesia equipment and its critical importance in the operating room setting, it is highly recommended that only appropriately trained and experienced professionals, using authentic Draeger Medical spare parts, be permitted to service and maintain this equipment. Please contact DrägerService at (800) 543-5047 or (215) 721-5402 for service of this equipment.

Draeger Medical also recommends that its anesthesia equipment be serviced at six-month intervals. Periodic Manufacturer's Certification Agreements are available for equipment manufactured by Draeger Medical. For further information concerning these agreements, contact DrägerService at (800) 543-5047 or (215) 721-5402.

Not for Use in Areas of Explosion Hazard

The Fabius GS is neither approved nor certified for use in areas where combustible or explosive gas mixtures are likely to occur. To avoid explosion hazards, flammable anaesthetic agents such as ether and cyclopropane or other flammable substances must not be used in this machine. Only anaesthetic agents that comply with the requirements on non-flammable anaesthetic agents in the IEC Standard, Particular requirements for the safety of anaesthetic machine, are suitable for use in this machine.

Safe Connection with Other Electrical Equipment

Electrical connections to equipment which are not listed in these Instructions for Use should only be made following consultations with the respective manufacturers or an expert and shall be in compliance with national medical device regulations.

Note: Systems must meet the requirements in accordance with IEC/EN 60601-1-1 and IEC/EN 60601-1-2.

Chapter 1 - Introduction

General information on electromagnetic compatibility (EMC) according to the international EMC standard IEC 60601-1-2: 2001

Medical electrical equipment needs special precautions regarding electromagnetic compatibility (EMC) and needs to be installed and put into service according to the EMC information provided in the technical documentation available from DrägerService upon request.

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

Pins of connectors identified with the ESD warning symbol shall not be touched and not be connected unless ESD precautionary procedures are used. Such precautionary procedures may include anti-static clothing and shoes, the touch of a ground stud before and during connecting the pins, or the use of electrically isolating and anti-static gloves. All staff involved in the above shall receive instruction in these procedures.

Operator’s Responsibility

The equipment design, the accompanying literature, and the labeling on the equipment take into consideration that the purchase and use of the equipment are restricted to trained professionals, and that certain inherent characteristics of the equipment are known to the trained operator. Instructions, warnings, and caution statements are limited, therefore, to the specifics of the Draeger Medical, Inc. design. This publication excludes references to hazards which are obvious to a medical professional, to the consequences of product misuse, and to potentially adverse effects in patients with abnormal conditions. Product modification or misuse can be dangerous. Draeger Medical, Inc. disclaims all liability for the consequences of product alterations or modifications, as well as for the consequences which might result from the combination of Draeger Medical, Inc. products with products supplied by other manufacturers if such a combination is not endorsed by Draeger Medical, Inc.

The operator of the anesthesia system must recognize that the means of monitoring and discovering hazardous conditions are specific to the composition of the system and the various components of the system. It is the operator, and not the various manufacturers or suppliers of components, who has control over the final composition and arrangement of the anesthesia system used in the operating room. Therefore, the responsibility for choosing the appropriate safety
monitoring devices rests with the operator and user of the equipment.

The Fabius GS is equipped to monitor breathing circuit pressure, exhaled volume and inspired oxygen, and to sound an alarm when any of these parameters violates a preset limit. The Fabius GS should not be used if any of these monitors are not functioning properly. Draeger Medical, Inc. also recommends that the Fabius GS only be used to deliver anesthesia and/or mechanical ventilation in accordance with the guidelines for patient monitoring published by the American Society of Anesthesiologists. In addition to volume, pressure, and oxygen monitoring, these guidelines require the use of a capnometer to monitor inspired and expired carbon dioxide as well as other patient monitors including continuous electrocardiography, pulse oximetry, and arterial blood pressure monitoring. Anesthetic agent monitoring and temperature monitoring are also strongly recommended. The responsibility for the selection of the best level of patient monitoring belongs solely to the equipment operator. To this extent, the manufacturer, Draeger Medical, Inc., disclaims responsibility for the adequacy of the monitoring package selected for use with the anesthesia system. However, Draeger Medical, Inc. is available for consultation to discuss monitoring options for different applications.

Restriction

Caution: Federal law and regulations in the United States restrict this device to sale by, or on the order of, a physician.

Intended Use

Fabius GS is an inhalation anesthesia machine for use in operating, induction and recovery rooms. It may be used with O₂, N₂O, and AIR supplied by a medical gas pipeline system or by externally mounted gas cylinders.

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

The following ventilation options are available:

- Volume Controlled Ventilation
- Pressure Controlled Ventilation (Optional)
- Pressure Support (Optional)
- SIMV/PS (Optional)
- Manual Ventilation
- Spontaneous Breathing

Fabius GS is equipped with an electrically driven and electronically controlled ventilator and monitors for airway pressure (P), volume (V), and inspiratory oxygen concentration (FiO₂).

As per EN740 (Anesthetic Workstations and their Modules- Particular Requirements), additional monitoring of the concentrations of CO₂ and anesthetic agent is required when the machine is in use.

Do not use readily flammable anesthetic agents such as ether, cyclopropane, etc.

Medibus and Vitalink Protocols

Medibus and Vitalink are software protocols for use in transferring data between the Fabius GS and an external medical or non-medical device (e.g., hemodynamic monitors, data management systems, or a Windows-based computer) via the RS-232 interface.

**WARNING !**

Data transferred via Medibus and Vitalink interfaces are for information only and are not intended as a basis for diagnosis or therapy decisions.

**WARNING !**

In order to protect patients and users from electrical hazards, it is imperative that all systems consisting of electrical medical devices and other electrical devices, such as but not limited to PCs, printers, etc., be mounted exclusively by trained personnel.

The system must meet the requirements about medical electrical equipment in accordance to IEC/EN 60601-1-1 and IEC/EN 60601-1-2.

Safety Features

- Monitoring of P, V, FiO₂
- O₂ SUPPLY LOW alarm
- Integrated S-ORC = Sensitive Oxygen Ratio Controller (control device to ensure minimum O₂ concentration of 23 Vol.%).

Per EN740, burns may occur if antistatic or electrically conductive ventilation tubes are used in combination with high-frequency electrical surgery equipment. Therefore, per EN740, these types of breathing tubes are not recommended.
Caution: Do not use Fabius GS in the environment of NMR tomography equipment. Malfunctions may result, thereby endangering the patient.

Caution: Do not use mobile phones within a distance of 10 meters from the machine. Mobile phones can cause malfunctions in electrical medical equipment, thereby endangering the patient and the operator.

Copyright, Trademark, and Limitation of Liability

Copyright
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Trademark Notices
DrägerService, Fabius GS, and Vitalink are registered trademarks of Draeger Medical, Inc. Drägersorb, D-Vapor, Vamos, and Vapor are registered trademarks of Dräger. Selectatec is a registered trademark of Datex-Ohmeda. All other products or brand names are trademarks of their respective owners.

Limitation of Liability
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Symbol Definition

The following symbols appear on the labels on the back of the Fabius GS and are defined below.

Caution: Refer to accompanying documents before operating equipment.

Caution: Risk of electric shock, do not remove cover. Refer servicing to a DrägerService representative.

Degree of protection against electric shock: Type B.

Registration Mark

Year Manufactured

The following symbols appear on the shipping container of the Fabius GS.

This end up.

Handle with care.

Keep dry.

Minimum and maximum storage temperatures.
The following symbols are used on other locations of the Fabius GS to provide quick and easy recognition of product functions.

Oxygen Concentration Sensor Port

Breathing Pressure Sensor Port

Breathing Volume Sensor Port

Ventilator Port

Pipeline, Gauge, Pipeline Inlet

Breathing Bag

Flowmeter Level Indicator

Indicates Direction

Total Power Applied

Partial Power Applied
Cylinder Gauge, Remote Cylinder Inlet

Do Not Oil

The following symbols are used on the Fabius GS monitoring user interface.

Table Top Light

Upper and Lower Alarm Limits

Return to Home Screen

Suppress Alarm Tone for Two Minutes

Standby Mode

Available Operating Capacity of UPS

Close Menu, Back to Previous Menu

Upper Alarm Limit

Lower Alarm Limit

Mains Applied/Mains Power
In addition to symbols already described, the following symbols appear on the optional Heated Breathing System Power Supply (HBSPS).

Fuse

Heater Power

DC Voltage

AC Voltage
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSY</td>
<td>Compact Breathing System</td>
</tr>
<tr>
<td>FLOW</td>
<td>Expiratory flow</td>
</tr>
<tr>
<td>FiO2</td>
<td>Inspiratory O₂ concentration</td>
</tr>
<tr>
<td>Freq</td>
<td>Ventilation frequency</td>
</tr>
<tr>
<td>Freq Min</td>
<td>Minimum ventilation frequency setting for Pressure Support Apnea Ventilation</td>
</tr>
<tr>
<td>MAN</td>
<td>Manual ventilation</td>
</tr>
<tr>
<td>MEAN</td>
<td>Mean (airway) pressure</td>
</tr>
<tr>
<td>N₂O</td>
<td>Nitrous Oxide</td>
</tr>
<tr>
<td>O₂</td>
<td>Oxygen</td>
</tr>
<tr>
<td>PAW</td>
<td>Airway pressure</td>
</tr>
<tr>
<td>PEAK</td>
<td>Peak (airway) pressure</td>
</tr>
<tr>
<td>PEEP</td>
<td>Positive end-expiratory pressure</td>
</tr>
<tr>
<td>PINSPI</td>
<td>Pressure setting in Pressure Control mode or the sum of ∆ PPS and PEEP settings in Pressure Support mode</td>
</tr>
<tr>
<td>PLAT</td>
<td>Plateau airway pressure</td>
</tr>
<tr>
<td>Pmax</td>
<td>Maximum (airway) pressure setting</td>
</tr>
<tr>
<td>∆ PPS</td>
<td>Pressure support setting in Pressure Support mode or SIMV/PS mode</td>
</tr>
<tr>
<td>SIMV</td>
<td>Synchronized Intermittent Mandatory Ventilation</td>
</tr>
<tr>
<td>SPONT</td>
<td>Spontaneous breathing</td>
</tr>
<tr>
<td>TI : TE</td>
<td>Ratio of inspiratory to expiratory time</td>
</tr>
<tr>
<td>Tip : Ti</td>
<td>Ratio of inspiratory pause time to inspiratory time</td>
</tr>
<tr>
<td>UPS</td>
<td>Uninterruptible power supply</td>
</tr>
<tr>
<td>VAC</td>
<td>Vacuum (e.g., for secretion aspiration)</td>
</tr>
<tr>
<td>VT</td>
<td>Tidal volume</td>
</tr>
</tbody>
</table>
General Warnings and Cautions

The following list of warnings and cautions apply to general operation and maintenance of the Fabius GS. Warnings and cautions about installing and operating specific parts appear with those topics.

- A Warning statement gives important information that, if ignored, could lead directly to personal injury.
- A Caution statement gives important information that, if ignored, could lead directly to equipment damage and indirectly to personal injury.

Warning: Any person involved with the setup, operation, or maintenance of the Fabius GS anesthesia system must be thoroughly familiar with this instruction manual.

Warning: This anesthesia system will not respond automatically to certain changes in patient condition, operator error, or failure of components. The system is designed to be operated under the constant surveillance and control of a qualified operator.

Warning: No third-party components shall be attached to the anesthesia machine, ventilator, or breathing system (except for certain approved exceptions). For more information, contact your local Authorized Service Organization or DrägerService at:

DrägerService
Draeger Medical, Inc.
3122 Commerce Drive
Telford, PA 18969
Tel: (215) 721-5402
(800) 543-5047
Fax: (215) 721-5784

Warning: Each institution and user has a duty to independently assess, based on its, his, or her unique circumstances, what components to include in an anesthesia system. However, Draeger Medical, in the interest of patient safety, strongly recommends the use of an oxygen analyzer, pressure monitor, volume monitor, and end-tidal CO2 monitor in the breathing circuit at all times.

Warning: Apply the caster brakes when the anesthesia machine is in use.

Warning: When moving the anesthesia machine, remove all monitors and equipment from the top shelf and use only the machine handles or push/pull bars. The anesthesia machine should only be moved by people who are physically capable of handling its weight. Draeger Medical recommends that two people move the anesthesia machine to aid in maneuverability. Exercise special care so that the machine does not tip when moving up or down inclines, around corners, and across thresholds (for example, in door frames and elevators). Do not attempt to pull the machine over any hoses, cords, or other obstacles on the floor.

Warning: Pressure Support ventilation is triggered by the patient's spontaneous effort to breathe. Most anesthetic agents will cause patients to have reduced ventilatory responses to carbon dioxide and to hypoxemia. Therefore, patient triggered modes of ventilation may not produce adequate ventilation. Additionally, the use of neuromuscular blocking agents will interfere with patient triggering.

Warning: When the moisture content falls below a specified minimum level, the following undesirable reactions can occur, regardless of the type of CO2 absorbent and the anesthetic agent used, e.g. Halothane, Enflurane, Isoflurane, Sevoflurane or Desflurane:

- reduced CO2 absorption,
- formation of CO,
- absorption and/or decomposition of the inhalation anesthetic agent,
- increased heat generation in the absorber, leading to higher breathing gas temperatures.

Additionally, the breakdown products of anesthetic agents exposed to dry absorbent are both flammable and toxic, and fires have been reported in association with the use of desiccated absorbent and volatile anesthetics.

These reactions can result in danger to the patient in the form of CO intoxication, insufficient depth of anesthesia and airway burns.
**Warning:** Route all lines/cables away from the APL valve to prevent interference with the APL valve adjustment knob. Lines/cables caught underneath the APL valve adjustment knob could interfere with proper functioning of this valve.

**Caution:** Although the Fabius GS is designed to minimize the effects of ambient radio-frequency interference, machine functions may be adversely affected by the operation of electrosurgical equipment or short wave or microwave diathermy equipment in the vicinity.

**Caution:** Communications with external equipment may be temporarily affected by electromagnetic interference due to the use of electrosurgical equipment.

**Caution:** Do not place more than 40 pounds on top of the Fabius GS monitor housing.

**Caution:** Never allow the battery to completely discharge. If the battery does discharge completely, recharge immediately.

**Caution:** Front GCX rails have a maximum accessories weight load of 5 lb./2.3 kg, extended out at 3 in./7.6 cm from the rail, at any position on the rail.
General Warnings and Cautions

Chapter 1 - Introduction

Fabius GS
Back Left Side
Accessory Option
with Breathing System
Mounted on Left Side

Caution: Possible Tip Over
Hazard if Mounting Accessories
Exceed Approved Limits.

Mount Arm Length

Option
Weight

30 lb. / 13.6 kg
28 lb. / 12.7 kg
26 lb. / 11.8 kg
24 lb. / 10.9 kg
22 lb. / 10.0 kg
20 lb. / 9.1 kg
18 lb. / 8.2 kg
16 lb. / 7.3 kg
14 lb. / 6.4 kg
12 lb. / 5.4 kg
10 lb. / 4.5 kg

15.0 in.
38.1 cm
10.0 in.
25.4 cm
5.0 in.
12.7 cm

Fabius GS
Back Right Side
Accessory Option
with Breathing System
Mounted on Left Side

Caution: Possible Tip Over
Hazard If Mounting Accessories
Exceed Approved Limits.

Mount Arm Length

Option
Weight

60 lb. / 27.2 kg
55 lb. / 24.9 kg
50 lb. / 22.7 kg
45 lb. / 20.4 kg
40 lb. / 18.1 kg
35 lb. / 15.9 kg
30 lb. / 13.6 kg
25 lb. / 11.3 kg
20 lb. / 9.1 kg
15 lb. / 6.8 kg
10 lb. / 4.5 kg

5.0 in.
12.7 cm
10.0 in.
25.4 cm
15.0 in.
38.1 cm

Approved
Mounting Limits

MAXIMUM WEIGHT
PER ARM 30 lb.
COMBINED MULTIPLE
ARM WEIGHTS NOT
TO EXCEED 60 lb. MAX.
**Fabius GS**

**Back Left Side**

Accessory Option with Breathing System Mounted on Right Side

**Option Weight**

- 60 lb / 27.2 kg
- 55 lb / 24.9 kg
- 50 lb / 22.6 kg
- 45 lb / 20.4 kg
- 40 lb / 18.1 kg
- 35 lb / 15.8 kg
- 30 lb / 13.6 kg
- 25 lb / 11.3 kg
- 20 lb / 9 kg
- 15 lb / 6.8 kg
- 10 lb / 4.5 kg

**Mount Arm Length**

- 15.0 in / 38.1 cm
- 10.0 in / 25.4 cm
- 5.0 in / 12.7 cm

**Caution:** Possible Tip Over Hazard if Mounting Accessories Exceed Approved Limits.

**Fabius GS**

**Back Right Side**

Accessory Option with Breathing System Mounted on Right Side

**Option Weight**

- 28 lb / 12.7 kg
- 26 lb / 11.7 kg
- 24 lb / 10.8 kg
- 22 lb / 9.9 kg
- 20 lb / 9.0 kg
- 18 lb / 8.1 kg
- 16 lb / 7.2 kg
- 14 lb / 6.3 kg
- 12 lb / 5.4 kg
- 10 lb / 4.5 kg

**Mount Arm Length**

- 5.0 in / 12.7 cm
- 10.0 in / 25.4 cm
- 15.0 in / 38.1 cm

**Caution:** Possible Tip Over Hazard if Mounting Accessories Exceed Approved Limits.
Configurations and Components

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Typical Fabius GS Configuration

The Fabius GS Inhalation Anesthesia Machine is a modular system consisting of a basic gas-delivery module with a variety of components and configuration designs to meet the requirements of various anesthesia delivery applications.

- 2-gas version (O2 and Air)
- 3-gas version (O2, N2O, and Air)
- pin index cylinder yokes and pressure gauges

Components

Vaporizers (Optional)

The Dräger Vapor® anesthetic agent vaporizers (1 in Figure 2) are used to enrich the fresh gas with a precisely metered quantity of vapor from the liquid anesthetic agent being used, i.e. Isoflurane, Halothane, Enflurane, or Sevoflurane. When using a Desflurane vaporizer:

<table>
<thead>
<tr>
<th>220 V Mains</th>
<th>Devapor*</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 V Mains</td>
<td>D-Tec*</td>
</tr>
<tr>
<td>230 V Mains</td>
<td>D-Vapor</td>
</tr>
</tbody>
</table>

* Devapor and D-Tec are available through your local Desflurane representative.

Note: The Fabius GS may be equipped with the Vapor Park option which provides a place to store a spare vaporizer on the side or back of the machine. Do not attempt to use the parked vaporizer for clinical use; it is not connected to the gas flow and is not functional in the parked position.
**Dräger Vapor Interlock System (Optional)**

The Fabius GS is configured for two vaporizers. An interlock system is used to ensure only one vaporizer can be used at a time.

Note that the selector lever (1 in Figure 3) is shown in the center position. This ensures that both vaporizers are in the locked position. Also, this is the recommended position for the selector lever when moving the Fabius GS.

Moving the selector lever away from the desired vaporizer allows that vaporizer to be utilized and the other to be locked out of use.

**Selectatec® (Optional)**

The interlock system for the Selectatec is built into the vaporizers. When a vaporizer is selected for use, the interlocking index pins will protrude from the sides of the vaporizer thereby not allowing the neighboring vaporizer to be opened. For more specific information on the Selectatec, refer to the Selectatec Vaporizer’s instruction manual.

**Heated Breathing System (Optional)**

The Fabius GS can be configured with an optional heated breathing system to reduce condensation of moisture in the system. See "Installation of HBSPS (Optional)" on page 57 for installation instructions.

**Auxiliary Oxygen Flowmeter (Optional)**

For the delivery of a metered flow of pure oxygen (for example, delivery of oxygen through a nasal cannula), an optional auxiliary oxygen flowmeter (1 in Figure 4) can be mounted on the left side of the flowmeter bank. This flowmeter can be used when the machine is turned off. A zero stop prevents damage to the flow control valve seat.
Components

Second Communications Port (Optional)

The Fabius GS can be configured with a second communications port that, like the standard communications port, supports Vitalink and Medibus communications (1 in Figure 5).

Recommended Device Configurations

Fabius GS with One COM Port
Gas Analyzer with One COM Port

Connect gas analyzer (1 in Figure 6) to Fabius GS COM1 (2 in Figure 6).
Fabius GS with One COM Port
Gas Analyzer with One COM Port
Automatic Anesthesia Record Keeper

1. Connect gas analyzer (1 in Figure 7) to anesthesia record keeper (2 in Figure 7).
2. Connect anesthesia record keeper to Fabius GS COM1 (3 in Figure 7).

Fabius GS with Two COM Ports
Gas Analyzer with One COM Port

Connect gas analyzer (1 in Figure 8) to Fabius GS COM2 (2 in Figure 8).

Note: Data Pass Through (gas analysis data) must be enabled by your local Authorized Service Organization or DrägerService.

Fabius GS with Two COM Ports
Gas Analyzer with One COM Port
Automatic Anesthesia Record Keeper

1. Connect gas analyzer (1 in Figure 9) to Fabius GS COM2 (2 in Figure 9).
2. Connect anesthesia record keeper (3 in Figure 9) to Fabius GS COM1 (4 in Figure 9).

Note: Data Pass Through (gas analysis data) must be enabled by your local Authorized Service Organization or DrägerService.
Components

Fabius GS with One or Two COM Ports
Multi Parameter Monitor with One COM Port
Automatic Anesthesia Record Keeper

1. Connect monitor (1 in Figure 10) to anesthesia record keeper (2 in Figure 10).
2. Connect anesthesia record keeper to Fabius GS COM1 (3 in Figure 10).

Note: Data Pass Through (gas analysis data) must be disabled by your local Authorized Service Organization or DrägerService.

Fabius GS with Two COM Ports
Multi Parameter Monitor with Two COM Ports
Automatic Anesthesia Record Keeper

1. Connect monitor (1 in Figure 11) to anesthesia record keeper (2 in Figure 11).
2. Connect anesthesia record keeper to Fabius GS COM1 (3 in Figure 11).
3. Connect monitor (1 in Figure 11) to Fabius GS COM2 (4 in Figure 11).

Note: Data Pass Through (gas analysis data) must be disabled by your local Authorized Service Organization or DrägerService.
# Operating Concept

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Overview

This chapter provides an overview of the user interface, which enables you to set and view monitoring, ventilation, and status information using the respective screens, windows, keys, soft keys, and the rotary knob. See “Monitoring” on page 79 for more information.

Standard Function Controls

Home Key
The Home key (1 in Figure 12) displays the main screen (the screen in Figure 12) from anywhere in the system.

Mains Power Applied LED
The Mains Power Applied LED (2 in Figure 12), when illuminated, indicates that the machine is connected to a Mains power source.

Selecting and Confirming
The rotary knob (3 in Figure 12) is used to select and confirm functions by:

- **Turning (Select)**
  Turning the rotary knob
  - moves the cursor over the system operating parameters or
  - changes the value of a parameter that has been confirmed for adjustment.

  **Note:** This function is indicated in the examples and instructions of this manual by “select.”

- **Pressing (Confirm)**
  Pressing the rotary knob either
  - confirms the system operating parameter to be adjusted or
  - confirms the change to the selected operating parameter.

  **Note:** This function is indicated in the examples and instructions of this manual by “confirm.”

Tabletop Light Key
The Tabletop Light key (4 in Figure 12) turns on the tabletop light.
Cross-Functional Controls and Displays

Cross-functional controls and displays are used for both monitoring and ventilation functions.

Key LED Indicators

LED indicators (1 in Figure 13) within keys (Volume Control, Pressure Control, Pressure Support, SIMV/PS, Man/Spont, Alarm Silence, and Standby) illuminate when that mode or function is selected and operating.

Setup Key

The Setup key is 2 in Figure 13.

Pressed During A Ventilation Mode

The Setup window (1 in Figure 14) replaces the Waveform area (3 in Figure 13).

The Setup window enables you to

- perform ventilation functions and
- view and change monitoring settings.

Note: The Volume Alarms On/Off soft key label does not appear in ManSpont mode because it is selectable on the ManSpont screen (Figure 32 on page 37).

Pressed During Standby Mode

The Standby Setup screen (Figure 15) appears. The Standby Setup screen enables you to define site defaults and configuration.
Status Bar
The following numbers in parenthesis refer to Figure 16.

Mode Display (1)
Displays the active ventilator mode.

Alarm Silence Status (2)
Displays the time remaining for alarm silence when the Silence Alarms key is pressed.

Battery Power Level (3)
Displays the status of the reserve power.

Time (4)
Displays the time.
Chapter 3 - Operating Concept

Monitoring

Monitoring Controls

LED Indicators

LED lamps (1 in Figure 17) in the upper right corner of the control panel indicate the degree of urgency of currently active alarms.

- Warning — Red Blinking
- Caution — Yellow Blinking
- Advisory — Yellow Continuous

Silence Alarms Key

The Silence Alarms key (2 in Figure 17) silences all active alarm tones for 2 minutes. It resets the silence time for two minutes each time the key is pressed.

Alarm Limit Key

The Alarm Limit key (3 in Figure 17) displays the Alarm Limits window (1 in Figure 18), which appears in the same location on all mode screens.

Setup Key

The Setup key (4 in Figure 17) is a cross-functional control. See “Setup Key” on page 26.
Monitoring Windows

The following numbers in boldface refer to Figure 19.

Alarm Window

The Alarm window (1) displays up to four of the highest priority alarms.

Oxygen Monitor Window

The Oxygen Monitor window (2) displays the inspiratory oxygen concentration in units of percent (%). It also displays the oxygen alarm limits in the far-right section of this window.

Respiratory Volume Monitor Window

The Respiratory Volume Monitor window (3) displays the patient's frequency (breaths per minute) or respiratory rate, tidal volume, minute volume, the minute volume high alarm limit, and the minute volume low alarm limit.

Breathing Pressure Monitor Window

The Breathing Pressure Monitor window (4) displays the patient's positive end expiratory pressure (PEEP), mean airway pressure (MEAN) or plateau airway pressure (PLAT), and peak airway pressure (PEAK).

Breathing Pressure Trace Window

The Breathing Pressure Trace window (5) displays a trace, or waveform, of the patient's breathing pressure.
Chapter 3 - Operating Concept

Selecting/Setting Monitoring Functions

The following example describes changing alarm limits on the Standby Setup Screen.

**Example**

1. Press the Setup key while the Standby Screen (Figure 20) is active. The Standby Setup screen (Figure 21) replaces the Standby Screen.

2. The rotary knob enables you to select the “Default Settings” or “Configuration” label. Select and confirm the “Default Settings” label.

   The Default Settings column is selected (Figure 22).

**Note:** Selecting and confirming the return arrow (1 in Figure 21) will deactivate the Standby Setup screen and activate the Standby screen (Figure 20).

**Note:** Selecting and confirming the return arrow (1 in Figure 22) will deselect the Default Settings column and reselect the Default Settings label as in Figure 21.
3. Select and confirm the “Alarm Limits” label. The Default Alarm Limits window appears (1 in Figure 23).

4. Select the alarm limit value that needs to change (Figure 24).

5. Confirm the alarm limit value and select a new value for the alarm limit (ex., in Figure 25, the value was changed from 30 to 25).

6. Confirm the new value for the alarm limit.
   The new alarm limit value is saved and the cursor moves over the return arrow.
Chapter 3 - Operating Concept

Ventilation

Note: Pressure Control, Pressure Support, and SIMV/PS ventilation modes, described in this manual, are optional.

Ventilation Controls

The following numbers in boldface refer to Figure 26.

Ventilation Mode Keys

Ventilation modes are selected by pressing one of the ventilation mode keys (1, 2, 3, 4, 5) and are confirmed by pressing the rotary knob. If the selection is not confirmed, the ventilation mode will not change.

Setup Key

The Setup key (6) is a cross-functional control. See “Setup Key” on page 26.

Standby Key

The Standby key (7) switches the ventilator to standby mode.

Monitoring and alarms are turned off and the ventilator stops.

Soft Keys

Soft keys (8) select ventilation parameters and functions.

Ventilator Compliance Compensation

Ventilator compliance compensation is continuously applied during Volume Control so that the tidal volume delivered to the patient corresponds to the Vt setting. Ventilator compliance is determined during the leak and compliance test performed from the Standby mode. To have compliance compensation work accurately, it is important that the patient hoses used during the leak/compliance test match the type of hoses used during the procedure.

Note: When the ventilator settings for Volume Control cause the ventilator to operate at its limits of performance, it is not possible for the Fabius GS to apply compliance compensation. If the ventilator's performance limit is reached, it is not possible to increment the Vt setting via the Volume Control Settings window.

Figure 26. Ventilation Monitor Screen and System Controls
Ventilation Screens

Soft Key Labels
The following numbers in boldface refer to Figure 27.
Each soft key (1) is associated with a ventilation parameter (2) that is associated with a specific ventilation mode (3).

Volume Control Mode
The following soft key labels appear from left to right along the bottom of the Volume Control screen. See Figure 28.

- **Pmax** (maximum ventilation pressure).
  The range for Pmax is 15 to 70 cmH2O.
  The factory default value is 40 cmH2O.
  (Pmax setting must be at least 10 cmH2O above PEEP)

- **VT** (tidal volume).
  The range for VT is 20 mL to 1400 mL.
  The factory default value is 600 mL.

- **Freq** (ventilation frequency).
  The range for Frequency is 4 bpm to 60 bpm.
  The factory default value is 12 bpm.

- **TI:TE** (time ratio between inspiration time and expiration time phases).
  The range for TI:TE is 4:1 to 1:4.
  The factory default value is 1:2.

- **TIP:TI** (relative inspiratory pause).
  The range for TIP:TI is 0% to 50%.
  The factory default value is 10%.

- **PEEP** (positive end expiratory pressure).
  The range for PEEP is 0 to 20 cmH2O.
  The factory default value is 0 cmH2O.
Chapter 3 - Operating Concept

Pressure Control Mode

The following soft key labels appear from left to right along the bottom of the Pressure Control screen. See Figure 29.

- **PINSP** (inspiratory pressure setting).
  The range for PINSP is 5 to 65 cmH₂O.
  **The factory default value is 15.**
  (PINSP setting must be at least 5 cmH₂O above PEEP)

- **Freq** (ventilation frequency).
  The range for Frequency is 4 bpm to 60 bpm.
  **The factory default value is 12 bpm.**

- **TI:TE** (time ratio between inspiration and expiration phases).
  The range for TI:TE is 4:1 to 1:4.
  **The factory default value is 1:2.**

- **Insp Flow** (maximum rate at which the piston travels upward to create the target pressure).
  The range for Insp Flow is 10 L/min to 75 L/min.
  **The factory default value is 30 L/min.**

- **PEEP** (positive end expiratory pressure).
  The range for PEEP is 0 to 20 cmH₂O.
  **The factory default value is 0 cmH₂O.**

Pressure Support Mode

Pressure Support ventilation is intended to reduce the work of breathing and is indicated for use only in patients who are breathing spontaneously. Patients who are not making spontaneous breathing efforts are not candidates for Pressure Support ventilation.

**Warning:** Pressure Support ventilation is triggered by the patient's spontaneous effort to breathe. Most anesthetic agents will cause patients to have reduced ventilatory responses to carbon dioxide and to hypoxemia. Therefore, patient triggered modes of ventilation may not produce adequate ventilation. Additionally, the use of neuromuscular blocking agents will interfere with patient triggering.

Apnea Ventilation is a feature within Pressure Support Ventilation. To enable Apnea Ventilation, adjust the Freq Min setting to a value other than “OFF”. If the detected patient spontaneous breathing rate falls below the set value, the ventilator automatically delivers a Pressure Support breath.
Warning: Apnea ventilation is intended to provide some degree of gas exchange if the patient's respiratory rate falls below the desired minimum setting. It is not intended as a primary mode of ventilation.

When delivering Apnea Ventilation, the Fabius GS uses the Pressure Support settings for \( \Delta \text{PPS} \), Freq Min, Insp Flow, and PEEP.

If two consecutive Apnea Ventilation breaths occur, the Caution message APNEA VENTILATION !! appears in the Alarm window. The alarm is cleared when a spontaneous breath is detected.

The following soft key labels appear from left to right along the bottom of the Pressure Support screen. See Figure 30.

- \( \Delta \text{PPS} \) (inspiratory pressure setting). The range for \( \Delta \text{PPS} \) is 3 to 20 cmH2O. **The factory default value is 10.**

- Freq Min (minimum ventilation frequency setting for Apnea Ventilation) The range for Freq Min is 3 to 20 bpm and "OFF". **The factory default is 3.**

- Trigger (Trigger Level - patient inspiratory flow threshold for Pressure Support). The range for Trigger is 2 to 15 L/min. **The factory default value is 2.**

- Insp Flow (maximum rate at which the piston travels upward to create the target pressure). The range for Insp Flow is 10 L/min to 85 L/min. **The factory default value is 30 L/min.**

- PEEP (positive end expiratory pressure). The range for Peep is 0 to 20 cmH2O. **The factory default value is 0 cmH2O.**

![Figure 30. Pressure Support Ventilation Screen](image-url)
SIMV / PS Mode
Synchronized Intermittent Mandatory Ventilation (SIMV) mode is a mixture of mechanical ventilation and spontaneous breathing. In SIMV mode, the patient can breathe spontaneously. SIMV will attempt to synchronize the mandatory ventilation strokes with spontaneous efforts.

The mandatory ventilation strokes are the same as those for VOLUME ventilation. They are defined by the parameters Vt, Frequency, Tinsp, TIP : Ti, and PEEP.

Pressure support can be added during SIMV mode to augment the patient’s spontaneous breathing efforts. Adjusting the Δ PPS level to a value other than OFF will enable Pressure Support during SIMV mode. (Refer to the “Pressure Support Mode” on page 34 for additional information on Pressure Support ventilation.)

The following soft key labels appear from left to right along the bottom of the SIMV / PS screen. See Figure 31.

• **PMAX** (maximum ventilation pressure). The range for PMAX is 15 to 70 cmH₂O. The factory default value is 40 cmH₂O. (PMAX setting must be at least 10 cmH₂O above PEEP and must be greater than Δ PPS+PEEP)

• **VT** (tidal volume). The range for VT is 20 mL to 1100 mL. The factory default value is 600 mL.

• **Freq** (ventilation frequency). The range for Frequency is 4 bpm to 60 bpm. The factory default value is 12 bpm.

• **Δ PPS** (inspiratory pressure setting). The range for Δ PPS is 3 to 20 cmH₂O or OFF. The factory default value is 10.

• **PEEP** (positive end expiratory pressure). The range for PEEP is 0 to 20 cmH₂O. The factory default value is 0 cmH₂O.
The following softkey labels can be accessed by pressing the “MORE” softkey as shown in Figure 31.

- **Trigger** (Trigger Level - patient inspiratory flow threshold for Pressure Support).
  The range for Trigger is 2 to 15 L/min.
  **The factory default value is 2.**

- **Insp Flow** (maximum rate at which the piston travels upward to create the target pressure).
  The range for Insp Flow is 10 L/min to 85 L/min.
  **The factory default value is 30 L/min.**

- **TInsp** (SIMV inspiratory time).
  The range for TInsp is 0.3 to 4.0 seconds
  **The factory default value is 1.7.**

- **TIP:TI** (relative inspiratory pause).
  The range for TIP:TI is 0% to 50%.
  **The factory default value is 10%.**

**ManSpont Mode**
The “Apnea Pressure” and “Volume Alarms” labels appear to the left of their ON/OFF label on the bottom of the ManSpont screen. See Figure 32. Pressing the ON/OFF soft key turns the applicable alarm(s) “ON” or “OFF.”
Chapter 3 - Operating Concept

Standby Mode
The following soft key labels appear from left to right along the bottom of the Standby screen.

- Run System Test
- Calibrate Flow Sensor
- Calibrate O2 Sensor
- Leak / Compl Test
- Access Alarm Log
- Restore Site Defaults

See “Standby Screen” on page 109 for details.

Flow Meter Monitor Window
The Flow Meter Monitor window is a graphical display of the flow rates of O2, Air, and N2O (L/min) (1 in Figure 34).

Note: On some non-U.S. units of the Fabius GS, the O2 and N2O virtual flow tubes have changed positions.

Figure 33. Standby Screen

Figure 34. Flow Meter Monitor Window


Changing Ventilation Modes

Volume Control and Pressure Control

The following example describes changing

- from the present ventilation mode “Volume Control” (1 in Figure 35)
- to the desired ventilation mode “Pressure” (2 in Figure 35) with the desired ventilation settings (3 in Figure 35).

1. Press the Pressure Control key.

   The LED associated with this key starts blinking (4 in Figure 35). It remains blinking until the selected mode of operation is confirmed.

   A message appears (5 in Figure 35) that provides instructions to confirm the mode change.

   The Waveform window is replaced by the Ventilator Settings window (6 in Figure 35) (Volume and Pressure modes only).

2. If the ventilation settings are correct, confirm the mode change.

3. If the ventilation settings are not correct, for each parameter that needs to change, press the corresponding soft key, select the correct value, and confirm the change.

4. When the parameter changes are completed, confirm the ventilation mode change.

   After the mode change is confirmed, the Pressure Control key LED switches from blinking to constantly on, the ventilator switches to the selected operating mode, and the waveform is restored.
Ventilator Setting Selection

Selected ventilator settings for the new mode of operation are automatically derived from the settings and performance of the last confirmed automatic ventilation mode. Settings affected in the new mode will be highlighted (1 in Figure 36).

The settings for Freq., Ti : TE, and PEEP are taken directly from the settings used in the former mode as applicable.

When changing from Volume Control to Pressure Control, Pinsp is set to the Plateau pressure developed in Volume Control.

When changing from Volume Control or Pressure Support to Pressure Control, the suggested value for Insf. Flow is either the last used value or the site default value.

When changing from Pressure Control to Volume Control, VT is set by dividing the last minute volume by the respiratory rate.

When changing from Pressure Control to Volume Control, the suggested value for Tip : Ti is either the last used value or the site default value.

When changing from Pressure Control to Volume Control, Pmax is set 10 cmH2O higher than the plateau pressure developed during Pressure Control.

When changing from Volume Control or Pressure Control to Pressure Support, the suggested value for Insf. Flow is either the last used value or the site default value.

When changing from Volume Control or Pressure Control to Pressure Support, the suggested value for PSUP is either the last used value or the site default value.

When changing from Volume Control or Pressure Control to Pressure Support, the suggested value for Trigger is either the last used value or the site default value.

When switching between Volume Control mode and SIMV/PS mode, the Pmax and PEEP settings shall automatically be transferred from the previous mode to the new mode.

When switching from Pressure Support mode to SIMV/PS mode, the Δ PPS, Insf Flow, Trigger, and PEEP settings shall automatically be transferred from the previous mode to the new mode.
When switching from SIMV/PS mode with Pressure Support enabled to Pressure Support mode, the $\Delta$ PPS and Insp Flow settings shall automatically be transferred from SIMV/PS to Pressure Support.

When switching from SIMV/PS mode to Pressure Support mode, the Trigger and PEEP settings shall automatically be transferred from SIMV/PS to Pressure Support.

**ManSpont**

ManSpont (Manual/Spontaneous) is a non-automatic mode of ventilation. However, the ventilation monitor and alarms are still operational. In ManSpont mode, the ventilator piston is moved partially upward to reduce system compliance. Manual ventilation (with APL valve pressure limit) can be delivered with the APL valve switch in the MAN position. Spontaneous ventilation (APL valve wide-open) can occur with the APL valve in the SPONT position.

The following examples describe changing

- from the present ventilation mode “Volume Control” (1 in Figure 37)
- to the desired ventilation mode “ManSpont” (2 in Figure 37).

**Spontaneous Breathing**

1. Press the ManSpont key.
   
   The LED associated with this key starts blinking (3 in Figure 37). It remains blinking until the selected mode of operation is confirmed.
   
   The Waveform window is replaced by the ManSpont window (4 in Figure 37).
   
   A message appears (5 in Figure 37) that provides instructions to confirm the mode change.

2. Confirm the mode change. The ManSpont screen is activated (Figure 38).
   
   After the mode change is confirmed, the ManSpont key LED switches from blinking to constantly on and the waveform is restored.

3. Rotate the APL valve knob fully counterclockwise to release pressure for spontaneous ventilation.

4. Set the appropriate fresh gas flow.

   **Note:** The ManSpont screen enables you to turn the Apnea Pressure alarm and Volume alarms ON or OFF.
Manual Ventilation

Note: In ManSpont mode, the apnea volume timer countdown for caution alarms changes from 15 seconds to 30 seconds, and for warning alarms from 30 seconds to 60 seconds.

1. Press the ManSpont key.
   The LED associated with this key starts blinking (1 in Figure 39). It remains blinking until the selected mode of operation is confirmed.
   The Waveform window is replaced by the ManSpont window (2 in Figure 39).
   A message appears (3 in Figure 39) that provides instructions to confirm the mode change.

2. Confirm the mode change. The ManSpont screen is activated (Figure 40).
   After the mode change is confirmed, the ManSpont key LED switches from blinking to constantly on and the waveform is restored.
   Note: The ManSpont screen enables you to turn the Apnea Pressure alarm and Volume alarms ON or OFF.

3. Adjust the APL valve knob to set the appropriate value for the maximum ventilation pressure (see “APL Valve” on page 48).

4. Press the O2 flush button, as required, to inflate the bag.

5. Set the fresh gas flow.

### Selecting/Setting Ventilation Parameters

1. In **Volume Control mode**, press the Volume Control key. The Volume Control Ventilation Settings window (1 in Figure 41) replaces the Waveform window.

   In **Pressure Control mode**, press the Pressure Control key. The Pressure Control Ventilation Settings Window (1 in Figure 42) replaces the Waveform window.

   In **Pressure Support mode**, press the Pressure Support key. The Pressure Support Ventilation Settings Window (1 in Figure 43) replaces the Waveform window.
In **SIMV/PS mode**, press the SIMV/PS key. The SIMV/PS Ventilation Settings Window (1 in Figure 44 or Figure 45) replaces the Waveform window.
The following example continues in **Volume Control mode**.

2. Press the VT (tidal volume) soft key.

   The Ventilator Settings window appears with the VT parameter label highlighted (1 in Figure 46).

3. Select a new VT parameter setting.

4. Confirm the new VT parameter setting.

   **Note:** Once the Ventilator Settings window is activated, it will return to the Waveform window if 15 seconds pass and neither the rotary knob nor a soft key is pressed.

   If the Home key is pressed, the Ventilator Settings window will return to the Waveform window.

   In either case, the ventilation parameter will remain as it was before it was activated in the Ventilator Settings window.
Fresh Gas Control

The following numbers in boldface refer to Figure 47. Flow is increased when the flow control knobs (N₂O (1), AIR (2), O₂ (3)) are turned counterclockwise.

The total flow meter (4) displays the flow measurement of all of the applied gases combined.

**Note:** The total flow meter is calibrated for a 50/50 mixture of N₂O and O₂. The accuracy of the flow meter may degrade with other gas mixtures. (See the Technical Data section for specifications.)

The total flow meter serves two purposes. The total flow meter provides a reference of the total fresh gas applied to the breathing circuit. (Flow rate measurements for each individual gas; N₂O, Air, and O₂; are provided by their respective electronic flow indicator.)

Should a fault develop in the electronic flow sensing, digital display, or power circuitry, the total flow meter is still functional. The measurement will indicate the total flow rate prior to the fault condition.

To adjust the fresh gas ratios while under the fault condition, shut off all flows (O₂ may be left on), and then restore each gas flow individually. For example, start with 2 L/min O₂. The total flow meter will read 2 L/min.

If 1 L/min of N₂O is needed, open the N₂O flow control knob until the total flow meter reads 3 L/min - 2 L/min O₂ plus 1 L/min N₂O.

The electronic fresh gas flow indicators (N₂O (5), AIR (6), O₂ (7)) display the flow measurement of each gas.

**Note:** The electronic fresh gas flow meters are altitude corrected.

The central supply pressure indicators (N₂O (8), AIR (9), O₂ (10)) display the pressure measurement of each gas entering the Fabius GS from the facility’s pipeline.

The cylinder gauges (O₂ (11), Air (12)) display the pressure measurement of each gas entering the Fabius GS from cylinders.

The O₂ Low Supply Pressure Alarm LED (13) flashes when the O₂ supply is below the factory set minimum pressure, nominally 20 psi (1.4 bar).

Figure 47. Flowmeter and Pressure Gauge Assembly Fresh Gas Flow Monitoring
Fresh Gas Flow Monitoring Resolutions

The Fabius GS can be configured by your Local Authorized Service Organization to display fresh gas flow rates either in a standard resolution mode or in a high resolution mode.

Standard Resolution

If standard resolution is configured (Figure 48), the numeric displays (LEDs) for the fresh gas flow rates support 100 ml/min. increments (format xx.x l/min.) and the flow meters on the monitor screen indicate a range of 0 to 12 l/min.

High Resolution

If high resolution is configured (Figure 49), the numeric displays (LEDs) for the fresh gas flow rates support 10 ml/min. increments (format x.xx l/min.) and the flow meters on the monitor screen indicate a range of 0 to 10 l/min. with an emphasis on resolution at the lower end of the scale.

High-resolution data is displayed when all individual gas flows are below 9.99 l/min.

Switching to standard resolution occurs when the highest flow rate is greater than 9.99 l/min.

Switching to high resolution occurs when the highest flow rate drops below 9.00 l/min.
APL Valve

**Warning:** Route all lines/cables away from the APL valve to prevent interference with the APL valve adjustment knob. Lines/cables caught underneath the APL valve adjustment knob could interfere with proper functioning of this valve.

The following numbers in boldface refer to Figure 50.

The APL valve (1) has two functions. It limits the maximum pressure during manual ventilation. It also exhausts excess gas into the scavenger system during manual and spontaneous ventilation.

The APL valve is connected to the patient airway through the ventilator. It functions only when the ventilator is in ManSpont mode or ventilator override condition.

The APL valve has a labeled knob (2) for selecting between spontaneous and manual modes of ventilation and for indicating approximate pressure settings.

When the APL valve knob is rotated fully counterclockwise, pressure is released for spontaneous ventilation. Spontaneous ventilation automatically eliminates resistance to patient exhalation.

In manual mode, the APL valve knob can be rotated to change the pressure threshold at which gas will flow through the valve and into the scavenging system. Clockwise rotation of the APL valve knob increases the pressure threshold, and counterclockwise rotation of the APL valve knob decreases the pressure threshold. Lifting the top of the APL valve knob will temporarily relieve pressure.

**Note:** The APL valve is automatically excluded from the breathing circuit whenever an automatic ventilator mode is selected.
Chapter 4 - Preparation

Preparation

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Activating the Battery

Note: Complete the Periodic Manufacturer’s Service procedure (SP00225) after you set up the Fabius GS anesthesia machine.

Activating the Battery

The Fabius GS anesthesia machine is shipped with the battery fuse disconnected in order to prevent discharge during shipment and storage prior to installation.

1. Remove the battery fuse from the top drawer of the Fabius GS.
2. Remove the battery fuse from its packaging.
3. Insert the battery fuse into the battery fuse holder (1 in Figure 51) (turn the fuse 1/4-turn clockwise until it is snug).

Gas Supply

Note: Medical gases must be dry and free from dust and oil.

The central gas supply gas connections are shown in Figure 52.

Medical Gas Pipeline Supply of O2, N2O, and AIR

Warning: Carefully check hoses each time you connect a machine to a wall or ceiling outlet to ensure that both ends of the hose are indexed for the same gas. Pipeline delivery hoses used between wall outlets and anesthesia machines have caused accidents when, during assembly, an oxygen fitting was placed on one end of the hose and a nitrous oxide fitting on the other end.

The following numbers in boldface refer to Figure 52.

1. Connect the N2O hose (1) to the connector on the Fabius GS and to the wall terminal unit (4) of the medical gas pipeline system.
2. Connect the AIR hose (2) to the connector on the Fabius GS and to the wall terminal unit (4) of the medical gas pipeline system.
3. Connect the O2 hose (3) to the connector on the Fabius GS and to the wall terminal unit (4) of the medical gas pipeline system.

Figure 51. Battery Fuse

Figure 52. 3-Gas Supply Connections
Cylinders with Pin-index Mounting

Warning: When attaching a cylinder, ensure that only one washer is installed between the cylinder and the yoke gas inlet. The use of multiple washers will inhibit the pin-index safety system. Be sure to verify the presence of the index pins each time a cylinder is installed. Never attempt to override the pin-index safety system.

Caution: Do not oil or grease the O2 cylinder valves and O2 pressure regulator. There is a risk of explosion.

If cylinder valves are leaky or difficult to open or close, they must be repaired in accordance with the manufacturer’s specifications.

Even if the gas supply is connected to a medical gas pipeline, the cylinders should remain on the device in reserve.

The following numbers in boldface refer to Figure 53.

To connect a gas cylinder (1) to its yoke:
1. Remove the old washer (2) and install a new washer on the seat of the yoke gas inlet connection.
2. Verify that the two index pins (3) below the gas inlet (4) are present.
3. Insert the head (5) of the gas cylinder into the yoke from below. Ensure that the gas outlet and indexing holes on the cylinder head align with the gas inlet and index pins of the yoke assembly (6).
4. Engage the indexing holes with the index pins.
5. Turn the yoke handle (7) clockwise against the cylinder head, so that the point of the yoke handle bolt is aligned with the indent on the back of the cylinder head.
6. Verify that the washer is in place, the index pins are engaged, and the cylinder hangs vertically.
7. Tighten the yoke firmly.

When required, the cylinder valve (8) is opened using the cylinder wrench (9) that is provided.
8. When a cylinder is removed, place the yoke plug (10) in the yoke assembly and tighten.
Electrical Supply

Cylinders attached to the hanger yokes must contain gas at the recommended pressures outlined in Table 1. (Indicated pressures are of E-size cylinders at 70°F, or 21°C.) Cylinders measuring less than the minimum recommended pressure (PSI - MIN) should be replaced with new, full cylinders.

<table>
<thead>
<tr>
<th>GAS</th>
<th>PSI/bar - FULL (typical full load)</th>
<th>PSI/bar - MIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>1900/131</td>
<td>1000/69</td>
</tr>
<tr>
<td>Nitrous Oxide</td>
<td>745/51</td>
<td>600/42</td>
</tr>
<tr>
<td>Oxygen</td>
<td>1900/131</td>
<td>1000/69</td>
</tr>
</tbody>
</table>

Electrical Supply

Fabius GS can be operated at mains voltages from 100 V to 240 V.

Push power plug into supply mains socket.

Switch on the machine. The system power switch (1 in Figure 54) is on the rear of the machine.

Attaching Manual (Ambu) Ventilation Bag

Hang the fully prepared and tested bag on the rail at the right (1).
Preparing the Ventilator

Use only disinfected/sterilized components.

The following numbers in boldface refer to Figure 56.

1. Swing out the ventilator door (1).
2. Unlatch the three clasps (2) to remove the cover (3).
3. Insert the diaphragm (4).
4. Fit the cover (3) and lock the three clasps.
5. Connect the ventilator chamber pressure sensor line (5) to the ventilator chamber pressure sensor line port (6).
6. Swing the ventilator unit (1) back into position.

Ventilator Safety Features

- High pressure safety relief valve (A)
- Negative pressure safety relief valve (B)
- Ventilator chamber pressure sensor

Attaching the CO₂ Absorber onto the Compact Breathing System

1. Remove the absorber canister (see “Replacing CO₂ Absorbent” on page 70 for more information).
2. Fill the absorber with fresh CO₂ absorbent to the fill line.
   Draeger Medical, Inc. recommends the use of Drägersorb 800® Plus or Drägersorb® FREE.
   **Note:** Ensure that no CO₂ absorbent dust/particles have been deposited between the gaskets and the sealing surfaces. Such dust and particles can cause leaks in the system.
3. Tighten the absorber by turning it to the right into the compact breathing system.
Attaching the Inspiratory Valve

The following numbers in boldface refer to Figure 58.

1. Place the valve disc (3) in the valve seat.
2. Place the gasket (4) on top of the valve disc.
3. Fit the inspection cap (with port) (5).
4. Tighten the retaining nut (6) securely.

Attaching the Expiratory Valve

The following numbers in boldface refer to Figure 58.

1. Place the valve disc (7) in the valve seat.
2. Place the gasket (8) on top of the valve disc.
3. Fit the inspection cap (9).
4. Tighten the retaining nut (10) securely.

Attaching the Adjustable Pressure Limiting (APL) Valve

Warning: Route all lines/cables away from the APL valve to prevent interference with the APL valve adjustment knob. Lines/cables caught underneath the APL valve adjustment knob could interfere with proper functioning of this valve.

Tighten the pressure-limiting valve (9 in Figure 59) securely into place with the retaining nut.
Chapter 4 - Preparation

Inserting the Flow Sensor

The following numbers in boldface refer to Figure 60.

1. Unscrew and remove the expiration port (1).
2. Insert the flow sensor (2).
3. Reinstall the expiration port (1).

Attaching the Waste Gas Outlet Port

Screw the waste gas port into the compact breathing system from underneath (3 in Figure 60).

Connecting the Compact Breathing System

The following numbers in boldface refer to Figure 61 and Figure 62.

Caution: The sealing rings on the threaded and conical connectors (5 and 6) must be undamaged and clean.

Caution: Only hand-tighten the threaded connectors. Do not use tools.

1. Pull and hold plunger (1) out to its full extension on the compact breathing system.
2. Fit the compact breathing system onto the compact breathing system mount (2).
3. Release the plunger (1) and rotate the compact breathing system until the plunger locks into position.
4. Screw the fresh gas hose from the Fabius GS (3) to the compact breathing system (4).
5. Screw the ventilation hose to the ventilator (5) and attach it to the conical connector ventilator port on the compact breathing system (6).
Installation of HBSPS (Optional)

The following provides instruction on installation of the optional Heated Breathing System Power Supply (HBSPS).

Left Mount COSY HBSPS Installation

The following numbers in boldface refer to Figure 63.

1. Install the power supply onto the left rear GCX rail of the Fabius GS by sliding the mounting plate of the power supply through the opening of the rail (1) and then sliding it upward. Tighten the knob (2) against the rail when the power supply is in the desired position.

2. Route the power cable (3) for the heater below and behind the power supply and then up to the rear of the COSY arm. Push the cable into the cable management cavity (4) on the bottom of the COSY arm.

3. Plug the connector at the end of the cable into the mating connector (5) on the rear underside of the COSY. Orient the connector so that the red mark on the connector plug aligns with the red mark on the receptacle.

Right Mount COSY HBSPS Installation

1. Install the power supply onto the left rear GCX rail of the Fabius GS by sliding the mounting plate of the power supply through the opening of the rail (1 in Figure 63) and then sliding it upward. Tighten the knob (1 in Figure 64) against the rail when the power supply is in the desired position.

2. Route the power cable for the heater through the trough (2 in Figure 64) on the rear of the cabinet. At the right hand end of the trough, route the cable into the cable management cavity (1 in Figure 65) on the bottom of the COSY arm.
3. Plug the connector at the end of the cable into the mating connector (2 in Figure 65) on the rear underside of the COSY. Orient the connector so that the red mark on the connector plug aligns with the red mark on the receptacle.

Connecting the Breathing Hoses

Note: Take care not to damage the breathing hoses.

When connecting and disconnecting, always hold the breathing hoses by the end sleeve, not by the spiral reinforcement (Figure 66). Otherwise, the spiral reinforcement may be torn loose.

Breathing hoses with a damaged spiral reinforcement can kink or become occluded.

Before each use, check the breathing hoses for damage.
Inserting A New O₂ Sensor Capsule

The following numbers in boldface refer to Figure 67.
1. Push patient breathing hoses (1) onto both the inspiratory and expiratory connectors or onto the microbial filters.
2. Connect both patient breathing hoses to the Y-piece (2).
3. Connect the bag (3) to the elbow port on the compact breathing system.

Figure 67. Installing Breathing Hoses

Inserting A New O₂ Sensor Capsule

Inserting a new O₂ sensor capsule:
The following numbers in boldface refer to Figure 68.
1. Unscrew the cap (1) from the sensor housing.
2. Remove the new sensor capsule from its packaging.
3. Insert the capsule (2) in the housing, with the ring-shaped conductors against the contacts in the housing.
4. Screw the cap (1) on firmly by hand.

Figure 68. O₂ Sensor Capsule Assembly
Connecting the O₂ Sensor

The following numbers in boldface refer to Figure 69.

Push the O₂ sensor into the port opening of the inspiratory port dome (1), and plug the connector into the connector panel.

Connecting the Pressure Sensor

The following numbers in boldface refer to Figure 70.

Press the pressure measuring line hose onto the hose barb (1) until it engages.

Caution: Do not squeeze the pressure measuring line hose when pressing it onto the hose barb.

Connect the pressure measuring line hose to the bacterial filter (2) and plug it firmly onto the port on the connector panel.
Connecting the Breathing Pressure Gauge

1. Connect the pressure gauge (1) to the compact breathing system mount (2) and secure with the retaining screw (3) and lockwasher (4).

Push the pressure measuring line hose onto the hose barb (5), the breathing pressure gauge port (6), and onto the port on the connector panel (7).

Connecting the APL Bypass and Peep/PMAX Hoses

The following numbers in boldface refer to Figure 72.

1. Plug the control hose to the connection port on the PEEP/PMAX valve (1) and to the connection port marked “PEEP” on the connection panel (2).

2. Plug the control hose to the connection port on the APL Bypass valve (3) and to the connection port marked “APL” on the connection panel (4).

Note: The control hoses are connected together near the end of each hose. The APL bypass hose is larger than the PEEP/PMAX hose.
Connecting the Flow Sensor
Push the cable onto the connection port on the flow sensor (1).

Installing Anesthetic Gas Scavenging Hose to the Compact Breathing System
Connect the transfer hose to the waste gas port of the Compact Breathing System and to the anesthetic gas scavenging line or an anesthetic agent filter.
A second transfer hose is required for the Semi-open compact breathing system.
Scavenger System for Fabius GS

Caution: Do not use anesthetic gas scavenging system in combination with extracorporeal oxygenator.

The following numbers in boldface refer to Figure 75.

Output connection (1) from the scavenger system to the hospital waste gas removal system.

Connection to scavenger system (2) from Fabius GS breathing system.

Flow indicator (3). During use, the flow indicator must be between the upper and lower marks on the tube.

Flow adjustment valve (4).

Note: Activate hospital vacuum system before using scavenger system.

For more detailed information on the scavenger system, refer to the separate specific Instructions for Use.

For detailed information regarding mounting the scavenger system to the Fabius GS anesthesia workstation, refer to specific instructions provided with the scavenger kit.

Additional Equipment

Prepare additional equipment as specified in the specific Instructions for Use.

Caution: If monitors and other equipment are placed on top of Fabius GS, the risk of tipping over the unit is increased, especially when rolling over thresholds etc.

Remove all monitors and other equipment from the top of the Fabius GS before moving the unit.

Daily and Preuse Checkout Form

Complete the "Daily and Preuse Checkout Form" in Appendix A.
# Operation and Shut-down

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Operation

Power-Up Screen

When the SYSTEM POWER switch is turned to the ON position, the Fabius GS performs extensive self-tests on its internal hardware. As these diagnostics are performed, each test and its result appear on the screen. The result, Pass or Fail, indicates the status of the tested component. See Figure 76.

Self-Diagnostic Conclusions

At the end of the self-diagnostics, one of three possible conclusions to the self-tests is posted on the screen (Figure 76).

FUNCTIONAL
Every component of the monitoring system is in satisfactory operational order. After a brief delay, the Standby screen appears.

CONDITIONALLY FUNCTIONAL
A noncritical fault was detected. The Fabius GS may be used, but call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).

Press the rotary knob to continue operation.

NON-FUNCTIONAL
A serious fault was detected and operation of the monitor and ventilator is inhibited. Do not use the machine. Immediately call your local Authorized Service Organization or DrägerService to correct the problem.
Power-Up Standby Screen

Following a successful power-up, the Standby screen appears (Figure 77) and provides instructions on starting the operation of the Fabius GS.

![Figure 77. Power-Up Standby Screen](image)

Ventilation Monitor Screen

When the Fabius GS is in use, monitoring information is displayed on the Ventilation Monitor screen.

See "Operating Concept" on page 23 for an explanation of the Ventilation Monitor screen controls and windows.

Setting the Vapor

The following numbers in boldface refer to Figure 79.

1. Ensure that the vaporizer is properly seated.
2. Lock the unused Vapor by sliding the lever (1) as far as it will go in the direction of the unused Vapor (in this example, the left hand Vapor is locked).
3. On the Vapor to be used, press and hold down the 0 button (2) and turn the handwheel (3) counter-clockwise to the desired anesthetic agent concentration.
4. Regularly check the filling level on the sight glass. When reaching the minimum mark, fill the Vapor with anesthetic agent.
5. Please refer to the specific Instructions for Use for Dräger Vapor.

![Figure 79. Setting the Vapor](image)
**Operation**

**O₂ Flush**

1. Press the O₂ Flush button (1 in Figure 80). Additional O₂ flows into the compact breathing system. The flow control elements and the anesthetic agent vaporizer (Vapor) are bypassed.

**Note:** In ManSpont mode, pressure may rise rapidly up to the setting of the APL valve.

**Minimum Flow of Anesthesia**

When long-term flow of anesthesia is below 0.5 L/min, increased humidity in the ventilator hose is a natural occurrence. Disconnect the ventilator hose from the compact breathing system and clean before and after long term procedures. Use water traps in the expiratory hose. Empty water traps if their water level exceeds the maximum water level limit.

**Nitrogen Wash-out (When Required)**

During anesthesia induction, air containing about 79% nitrogen (N₂) remains in the compact breathing system (and in the patient’s lungs). If the unit will be used for a low-flow anesthesia case, press the O₂ Flush to remove this N₂.
Replacing CO₂ Absorbent

The CO₂ absorbent in the compact breathing system should be replaced when two-thirds of the CO₂ absorbent has changed color. Draeger Medical recommends the use of Drägersorb 800® Plus or Drägersorb® FREE. The color change indicates that the CO₂ absorbent can no longer absorb CO₂ (Drägersorb 800® Plus and Drägersorb® FREE change from white to violet).

Do not flush CO₂ absorbent for long periods with dry gas because the CO₂ absorbent will dry out.

**Warning:** When the moisture content falls below a specified minimum level, the following undesirable reactions can occur, regardless of the type of CO₂ absorbent and the anesthetic agent used, e.g. Halothane, Enflurane, Isoflurane, Sevoflurane or Desflurane:

- reduced CO₂ absorption,
- formation of CO,
- absorption and/or decomposition of the inhalation anesthetic agent,
- increased heat generation in the absorber, leading to higher breathing gas temperatures.

Additionally, the breakdown products of anesthetic agents exposed to dry absorbent are both flammable and toxic, and fires have been reported in association with the use of desiccated absorbent and volatile anesthetics.

These reactions can result in danger to the patient in the form of CO intoxication, insufficient depth of anesthesia and airway burns.

**Note:** Please refer to the specific Instructions for Use for “Drägersorb 800® Plus or Drägersorb® FREE”.

Draeger Medical recommends that absorbent be changed, regardless of color, if the anesthesia machine has been idle for 48 hours or more. Further, Draeger Medical recommends that it be changed at the beginning of the work week.

**Warning:** Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When replacing the absorbent, take care not to spill its caustic contents.
1. Empty the expired CO₂ absorbent from the absorber into an appropriate refuse container.

2. Fill the absorber with fresh CO₂ absorbent.

   **Note:** Ensure that no CO₂ absorbent dust/particles have been deposited between the gaskets and sealing surfaces. Such dust and particles can cause leaks in the system.

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

**Power Failure Backup**

When AC power is interrupted from the Fabius GS, the internal battery backup will provide full operation of the ventilator and internal monitors for up to two hours after the power interruption. The battery depletion rate depends upon ventilator settings and the condition of the battery (age and level of charge), but under no circumstances should a fully charged battery provide less than 45 minutes of full functionality.

The transition to battery-powered operation will not interrupt any machine functions. At the transition, and as the battery is discharged, the following information will be displayed:

- The battery symbol (_battery) appears in the status bar and the Mains Power LED turns off.
- The “POWER FAIL!” Advisory alarm message is displayed in the alarm window.
- When the battery is discharged to 20% of its reserve power, the “BATTERY LOW!” Advisory alarm message is displayed in the alarm window.
- When the battery is discharged to 10% of its reserve power, the “BATTERY LOW!!” Caution alarm message replaces the Advisory alarm message in the alarm window.
- When the battery is almost fully discharged, the ventilator will stop and the Ventilator Fail Warning alarm message (VENTILATOR FAIL!!!) is displayed in the alarm window.

If manual ventilation is not provided, the Apnea Pressure Warning (APNEA PRESSURE!!), Apnea Flow Warning (APNEA FLOW!!), and Minute Volume Low Caution (MINUTE VOLUME LOW!!) alarm messages are displayed in the alarm window.

- The internal monitors continue to operate until the battery is completely discharged and all electronics are shut down.
Chapter 5 - Operation and Shut-down

Warning: When the “BATTERY LOW!!” Caution alarm message is first displayed, the ventilator will continue to operate for up to an additional 10 minutes. Then, automatic ventilation is not available until AC power is restored.

Caution: Never allow the battery to completely discharge. If the battery does discharge completely, recharge immediately.

When the battery is completely discharged, all pneumatic functions of the Fabius GS continue to be available (APL valve, breathing pressure gauge, cylinder and pipeline gauges, fresh gas and agent delivery, S-ORC, and total flowmeter). Manual or spontaneous ventilation can be maintained.

Ventilator Fail State

If the Fabius GS does not recover from a VENTILATOR FAIL condition,

1. Switch to ManSpont mode by pressing the ManSpont key and confirming the mode change by pressing the rotary knob.
2. Set the APL valve to MAN position.
3. Adjust the APL pressure limit for the desired inspiratory plateau pressure.
4. Press the O2 flush button on the Fabius GS as required to sufficiently inflate the breathing bag.
5. Manually ventilate the patient by squeezing the breathing bag.

Note: In the ventilator fail situation, the ventilator piston assembly position may not be locked. As a result, airway pressure may initially push the piston back to its limit stop, increasing the volume of the breathing circuit. It may be necessary to press the O2 flush button again to reinflate the breathing bag.
Overriding the Ventilator

In the unlikely event of a fault in which the ventilator does not recover, and the user cannot switch to manual ventilation mode through the use of the ManSpont key and rotary knob, manual ventilation is still possible.

1. Locate the system power switch on the rear panel.
2. Toggle the system power switch to “off” (Figure 82) and then
3. Toggle the system power switch back to “on” (Figure 83).

The ventilator now performs as in ManSpont mode.

4. Set the APL valve to MAN position.
5. Adjust the APL pressure limit for the desired inspiratory plateau pressure.
6. Press the O2 flush button on the Fabius GS as required to sufficiently inflate the breathing bag.
7. Manually ventilate the patient by squeezing the breathing bag.

**Note:** After toggling the main power switch, the Fabius GS will perform its diagnostic tests. During the diagnostic tests, manual ventilation is possible. If the diagnostic tests result in “FUNCTIONAL”, the Fabius GS will automatically switch to ManSpont mode if fresh gas flow is detected. Fabius GS respiratory monitoring is available. If the diagnostic tests result in NON-FUNCTIONAL, Manual ventilation is still possible but Fabius GS respiratory monitoring is not available.

**Note:** In ventilator override situation the ventilator piston assembly position may not be locked, as in ManSpont mode. As a result, airway pressure may initially push the piston back to its limit stop, increasing the volume of the breathing circuit. It may be necessary to press the O2 flush button again to reinflate the breathing bag.

8. Contact your local Authorized Service Organization before using the ventilator.
Operation of HBSPS (Optional)

1. Plug the power cord (1 in Figure 84) into a mains power outlet on the wall. The green LED for MAINS POWER (2 in Figure 84) will illuminate when the plug is connected to power.

2. Switch the HEATER POWER switch (1 in Figure 85) to the ON position (top of the rocker depressed). The HEATER POWER LED will illuminate (2 in Figure 85).

3. After 15 to 30 minutes, the underside of the COSY will feel slightly warm.

To avoid the possibility of drying out absorbent, it is recommended that the heater be turned off when not in use.

Warning: When the moisture content falls below a specified minimum level, the following undesirable reactions can occur, regardless of the type of CO2 absorbent and the anesthetic agent used, e.g. Halothane, Enflurane, Isoflurane, Sevoflurane or Desflurane:

- reduced CO2 absorption,
- formation of CO,
- absorption and/or decomposition of the inhalation anesthetic agent,
- increased heat generation in the absorber, leading to higher breathing gas temperatures.

Additionally, the breakdown products of anesthetic agents exposed to dry absorbent are both flammable and toxic, and fires have been reported in association with the use of desiccated absorbent and volatile anesthetics.

These reactions can result in danger to the patient in the form of CO intoxication, insufficient depth of anesthesia and airway burns.
**Operation**

**HBSPS Problem Resolution**

**Note:** Call DrägerService or your local Authorized Service Organization if the following steps do not resolve HBSPS problems.

**Bottom of COSY Not Warm After 30 Minutes**

1. Ensure that the HEATER POWER switch (1 in Figure 86) is in the ON position.
2. Ensure that the “HEATER POWER ON” LED is illuminated (2 in Figure 86).
3. Check that the connector (1 in Figure 87) on the cable running to the COSY is plugged in properly.
4. Check that the MAINS POWER LED (1 in Figure 88) is illuminated and that the Mains Power cord (2 in Figure 88) is plugged into a functioning wall outlet.

"HEATER POWER ON LED" Is Not Illuminated

If the "HEATER POWER ON" LED (2 in Figure 86) is not illuminated when the HEATER POWER switch (1 in Figure 86) is in the ON position and the MAINS POWER LED (1 in Figure 88) is illuminated, check the fuse (3 in Figure 86). If it is blown, replace it with the properly rated fuse.

**MAINS POWER LED Is Not Illuminated**

If the MAINS POWER LED (1 in Figure 88) is not illuminated when the mains power cord (2 in Figure 88) is plugged into a wall outlet:

1. Check that the wall outlet is functioning and the plug is plugged into it properly.
2. Check that the power supply-end cord plug (4 in Figure 88) is plugged into the power supply properly.
3. Check the two fuses in the power inlet assembly (3 in Figure 88). Replace them if they are blown.
Preparation for Transport or Storage

Warning: When moving the anesthesia machine, remove all monitors and equipment from the top shelf, remove the absorber system, and use only the machine handles to push or pull the unit. The anesthesia machine should only be moved by people who are physically capable of handling its weight. Draeger Medical recommends that two people move the anesthesia machine to aid in maneuverability. Exercise special care so that the machine does not tip when moving up or down inclines, around corners, and across thresholds (for example, in door frames and elevators). Do not attempt to pull the machine over any hoses, cords, or other obstacles on the floor.

Switch Off the Anesthetic Agent Vaporizer

(Dräger Vapor)

Turn the handwheel (1 in Figure 89) to 0 until the button engages.

Figure 89. Closing the Vaporizer

1
Preparation for Transport or Storage

Chapter 5 - Operation and Shut-down

Switching Off the Ventilator

The following numbers in boldface refer to Figure 90.

1. Switch the anesthesia ventilator to standby by pressing the Standby button (1).
2. Confirm by pressing the rotary knob (2). Fabius GS is now in standby mode.

Remove the O₂ Sensor

Remove the O₂ sensor from the inspiratory valve and leave exposed to air. This precaution prolongs the service life of the O₂ sensor.

Switching Off HBSPS (Optional)

1. Switch the HEATER POWER switch (1 in Figure 91) to the OFF position (bottom of the rocker depressed). The HEATER POWER LED will darken (2 in Figure 91).
2. Unplug the power cord (3 in Figure 91) from the mains power outlet on the wall.
**Switch Off System Power**

Switch off the unit using the switch at the back (1) and disconnect the power plug.

**Disconnect the Central Gas Supply**

1. Remove all plug-in couplings from the wall terminal units.
2. Close gas cylinders.
3. Press the O2 Flush to depressurize the entire system.
Monitoring

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Overview

This chapter describes functions that are specific to oxygen monitoring, respiratory volume monitoring, and breathing pressure monitoring. For information on general monitoring functions, see “Operating Concept” on page 23.

Alarms

Setting Alarm Limits

The Alarm Limits key enables you to set alarm limits for the present procedure.

To set the default alarm limits that take effect at power-up, see “Setting Alarm Limit Defaults” on page 116.

Alarm Limits Key

The Alarm Limits key is shown at 1 in Figure 94. Displays the Alarm Limits window (1 in Figure 95). Use the select and confirm process outlined in “Selecting/Setting Monitoring Functions” on page 30 to change the alarm limits on the Alarm Limits window.

Alarm LED Indicators

The Alarm LED indicators are shown at 2 in Figure 94. See “LED Indicators” on page 28 for details.

Alarm Tones

The alarm tones provide an audible alert to the message displays. Each message is assigned a tone or sequence of tones to indicate its degree of urgency.

• Warning (continuous)
• Caution (every 30 seconds)
• Advisory (single signal or no tone for selected advisories only)

Alarm Text Display Convention

• Warnings are followed by three exclamation marks (!!!).
• Cautions are followed by two exclamation marks (!).
• Advisories are followed by one exclamation mark (!).
Oxygen Monitoring

Oxygen Monitoring Overview

Inspiratory oxygen concentration is measured with a dual galvanic cell sensor, which is attached to the inspiratory valve dome. The sensor contains two independent electrochemical cells, or sensor halves. When the sensor is exposed to oxygen, an electrochemical reaction occurs within each cell. The oxygen monitor measures the current produced in each cell, computes an average for the two cells, and translates the average into an oxygen concentration measurement.

Caution: Never remove an oxygen sensor from its housing, except to replace it. If a sensor is removed from its housing, you must do the following before continuing normal operations:

- Reinstall the sensor in the housing.
- Calibrate the sensor.

Note: When the machine is not in use, remove the oxygen sensor assembly from the inspiratory valve dome, and insert the valve dome plug into the dome.

Oxygen Monitor Window

The following numbers in boldface refer to Figure 96.

- 1 - the numerical value for inspiratory oxygen concentration in units of percent (%) between 10% and 100%
- 2 - the high oxygen concentration alarm limit
- 3 - the low oxygen concentration alarm limit
Oxygen Monitor Controls

The following numbers in boldface refer to Figure 97. You use the Alarm Limits key (1), Setup key (2), and rotary knob (3) to set oxygen concentration alarm limits and calibrate the oxygen sensor.

Setting Oxygen Alarm Limits

At power-up, the oxygen high and low alarm limits are automatically set to their default settings (See “Default Settings” on page 113 for more information). You can adjust these limits within specified ranges.

Oxygen Alarm Limits

Oxygen High Limit
The Oxygen High Alarm Limit range is from 19% to 100%. The Oxygen High Limit can not be set less than or equal to the Oxygen Low Limit. **The factory default for Oxygen High Limit is 100%.**

Oxygen Low Limit
The Oxygen Low Alarm Limit range is from 18% to 99%. The Oxygen Low Alarm Limit can not be set equal to or greater than the Oxygen High Limit. **The factory default value for Oxygen Low Limit is 20%.**

Procedure
See “Alarms” on page 81 to change the high or low alarm limit.
Chapter 6 - Monitoring

Calibrating the Oxygen Sensor

To calibrate the oxygen sensor correctly, make sure it is exposed only to room air during the entire calibration period. The oxygen sensor should be calibrated as part of the daily preoperative setup of the anesthesia equipment.

1. Press the Setup key (1 in Figure 98).

The Setup screen appears (Figure 99).

2. Press the soft key under the Calibrate O2 Sensor soft key label (1 in Figure 99).

The Calibrate O2 Sensor Instruction window replaces the Setup screen soft key labels window (Figure 100).

After the instructions are followed and the rotary knob is pressed, the present O2 value is replaced by “CAL” (1 in Figure 101).

Upon successful completion of the calibration, the O2 concentration measurement is restored.

If, at the end of the calibration period, the O2 SENSOR FAIL! Advisory message appears in the Alarm window, the calibration was not successful.

An unsuccessful calibration can be caused by several conditions as described in Table 2 on page 85.
Table 2. Unsuccessful Calibration - Causes and Solutions

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<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor was exposed to an excessively lean or excessively rich oxygen calibration mixture.</td>
<td>Make sure that the sensor is exposed to room air for the entire calibration period.</td>
</tr>
<tr>
<td>Sensor was exposed to a constantly changing calibration mixture.</td>
<td>Make sure that the sensor is exposed to room air for the entire calibration period.</td>
</tr>
<tr>
<td>Sensor did not receive the proper waiting period.</td>
<td>If the sensor capsule was removed from the sensor assembly, a waiting period equal to the time that the capsule spent outside the sensor assembly is necessary prior to calibration. New sensors require a 15-minute waiting period.</td>
</tr>
<tr>
<td>Sensor is exhausted.</td>
<td>If the oxygen sensor has decayed beyond its useful service life (see the “Specifications” section of the manual), replace the exhausted sensor with a new sensor and allow the proper waiting period.</td>
</tr>
<tr>
<td>Sensor is disconnected.</td>
<td>When the sensor is disconnected or if there is no cell in the housing, the display area is blank, and the message O2 SENSOR FAIL! appears in the Alarm window. If this happens, ensure that the sensor is correctly assembled and recalibrate the oxygen sensor.</td>
</tr>
</tbody>
</table>

Consequences

If the oxygen sensor is improperly calibrated, it can cause inaccurate measurements. When a calibration gas mixture is excessively rich or lean in oxygen, the Fabius GS will not complete an attempted calibration; however, if the calibration gas is rich or lean but is within certain limits, the Fabius GS will complete the calibration. As a result, when displaying sensor measurements, the Fabius GS displays an oxygen percentage either higher or lower than the actual oxygen percentage. Therefore, make sure that the sensor is exposed only to room air during the entire calibration period.

Figure 102 illustrates the relationship between the calibration mixture and the accuracy of oxygen measurement.

A = Displayed O₂ Percentage

B = Actual O₂ Percentage

1 = At calibration, sensor exposed to < 21% O₂. Thus, displayed % O₂ will be higher than actual O₂.

2 = Correct calibration of room air (21% O₂) for entire calibration period. Displayed % O₂ = actual % O₂.

3 = At calibration, sensor exposed to > 21% O₂. Thus, displayed % O₂ will be lower than actual % O₂.
Chapter 6 - Monitoring

Oxygen Alarm Messages

The following list contains all warning, caution, and advisory alarms associated with oxygen monitoring.

INSP O2 LOW (Warning)

The Warning message INSP O2 LOW!!! appears in the Alarm window and an alarm sounds if the measured inspiratory oxygen concentration falls below the low alarm limit.

O2 SUPPLY LOW (Warning)

The Warning message O2 SUPPLY LOW!!! appears in the Alarm window and an alarm sounds if the oxygen supply drops too low to properly pressurize the fresh gas circuit (below about 20 psi (1.4 bar)).

The red LED indicator in the O2 area will flash until the O2 supply is restored.

Under normal operating conditions, the O2 supply channel is pressurized sufficiently to prevent this alarm from occurring. If the O2 supply pressure fails and O2 is not being used by the Fabius GS, the circuit will remain pressurized and the O2 SUPPLY LOW alarm will not annunciate immediately. If pressure is reduced in this circuit by the use of O2, O2 flush, etc., the alarm will annunciate when the internal supply pressure drops below 20 psi (1.4 bar), nominal.

INSP O2 HIGH (Caution)

If the measured inspiratory oxygen concentration exceeds the high alarm limit, the Caution message INSP O2 HIGH!! appears in the Alarm window, and an intermittent audible alarm sounds.

O2 SENSOR FAIL (Advisory)

The Advisory message O2 SENSOR FAIL! appears in the Alarm window when any of the following instances occur:

- O2 sensor has not been correctly calibrated.
- O2 sensor replaced and/or not calibrated.
- O2 sensor used up.
- O2 sensor disconnected.
- Faulty sensor cable.

O2 SENSOR CAL DUE (Advisory)

More than 18 hours have passed since the last sensor calibration.
Oxygen Monitoring Problem Resolution

Table 3. Oxygen Monitoring Problem Resolution

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm Message O2 SENSOR FAIL! appears in Alarm window.</td>
<td>Sensor needs calibration (Display area remains blank when a reading is expected.)</td>
<td>Perform proper calibration. Remove sensor assembly from breathing circuit. Make sure sensor is exposed to room air only. Calibrate the sensor.</td>
</tr>
<tr>
<td></td>
<td>Hardware malfunction.</td>
<td>Contact your local Authorized Service Organization or DrägerService.</td>
</tr>
<tr>
<td></td>
<td>Faulty sensor housing and cable.</td>
<td>Replace housing/cable assembly.</td>
</tr>
<tr>
<td></td>
<td>Sensor cord is disconnected.</td>
<td>Insert sensor cord connector into the interface panel.</td>
</tr>
<tr>
<td>Pressing the Calibrate O2 Sensor soft key does not initiate calibration.</td>
<td>Sensor is disconnected.</td>
<td>Insert sensor cord connector into the interface panel.</td>
</tr>
<tr>
<td></td>
<td>Sensor cord is damaged.</td>
<td>Replace housing/cord assembly.</td>
</tr>
<tr>
<td>Pressing Calibrate O2 Sensor soft key initiates calibration, but Oxygen Monitor window is blank at end of calibration period.</td>
<td>Sensor is exposed to incorrect oxygen concentration.</td>
<td>Expose sensor to room air for 21% calibration.</td>
</tr>
<tr>
<td></td>
<td>Sensor exposed to constantly changing calibration mixture.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sensor capsule was removed from housing for a prolonged period.</td>
<td>Allow a waiting period equal to duration of capsule removal.</td>
</tr>
<tr>
<td></td>
<td>New capsule not given proper waiting period.</td>
<td>Allow 15 minute waiting period.</td>
</tr>
<tr>
<td></td>
<td>Exhausted or faulty sensor capsule.</td>
<td>Replace sensor capsule.</td>
</tr>
</tbody>
</table>
Respiratory Volume Monitoring

Overview

Respiratory volume is measured using thermal anemometry. The flow sensor output is converted into meaningful readings for minute volume, tidal volume, and respiratory rate displays.

Caution: Although the Fabius GS is designed to minimize the effects of ambient radio-frequency interference, the functioning of the respiratory volume monitor may be adversely affected by the operation of electrosurgical equipment or short wave or microwave diathermy equipment in the vicinity.

Note: Sudden, irregular expiratory flow may cause erratic tidal volume and respiratory rate displays. To avoid such erroneous measurements, defer reading the display until a full minute has elapsed after the irregular flow has stopped.
Respiratory Volume Monitoring

Respiratory Volume Monitor Display

Information about the patient's respiratory volume is presented in the Respiratory Volume Monitor window in the middle of the monitor display as shown in Figure 103. From left to right, measured values are shown for breathing frequency (1), tidal volume (2), and minute volume (3). At the extreme right, in small type, is the minute volume high alarm limit (4) and the minute volume low alarm limit (5).

The following numbers in boldface refer to Figure 103.

- **Frequency (Freq) (1)**
  Shows the number of breaths during the previous minute of respiration.
  Readings appear after two breaths.
  The numeric data is displayed in units of Breaths Per Minute (bpm).
  The display range is from 2 bpm to 99 bpm.

- **Tidal Volume Measurement (VT) (2)**
  Displays the expired volume for each breath.
  The numeric data is displayed in units of milliliters (mL).
  The display range is from 0 mL to 1500 mL.

- **Minute Volume Measurement (MV) (3)**
  Continuously displays the volume of exhaled gas accumulated during the previous minute of respiration.
  The numeric data is displayed in units of liters/minute (L/min).
  The display range is from 0.0 L/min to 99.9 L/min.

- **Minute Volume Alarm High Limit (4)**
  Indicates the volume above which an alarm condition occurs.
  The numeric data is displayed in units of liters/minute (L/min).

- **Minute Volume Alarm Low Limit (5)**
  Indicates the volume below which an alarm condition occurs.
  The numeric data is displayed in units of liters/minute (L/min).
Respiratory Volume Monitor Controls

The following numbers in boldface refer to Figure 104.

You can use the Alarm Limits key (1), the Setup key (2), and the rotary knob (3) to set the high and low respiratory volume alarm limits and to disable volume alarms.

While the ventilator is on and the volume alarms are enabled, apnea alarms are generated if the respiratory volume monitor does not sense a valid breath for a specified period (see “APNEA FLOW (Warning/Caution)” on page 91).

While the ventilator is off and the system is in ManSpont mode, these alarms are generated at 30 seconds (Caution) and 60 seconds (Warning).

The Fabius GS's volume alarms are automatically enabled when the ventilator is switched from Standby to a ventilation mode.

Setting the Minute Volume Alarm Limits

If the minute volume falls below the minute volume low alarm limit or above the minute volume high limit, an alarm condition occurs.

Minute Volume High Limit

The Minute Volume High Limit range is from 0.1 L/min. to 20.0 L/min.

Factory default value: 12.0 L/min.

Minute Volume Low Limit

The Minute Volume Low Limit range is from 0.0 L/min. to 19.9 L/min.

Factory default value: 3.0 L/min.

Procedure

See “Alarms” on page 81 to change the high and low alarm limit.

See “Setup Window Access” on page 101 to disable/enable volume alarms.
Respiratory Volume Alarm Messages

The following list contains all warning, caution, and advisory alarms associated with respiratory volume monitoring.

APNEA FLOW (Warning/Caution)

The Fabius GS continuously monitors the expiratory flow in the patient breathing system. By processing the expiratory flow pattern, the monitor can determine whether a valid breath has occurred. A valid breath has a tidal volume of 20 mL or greater.

When the system is in Pressure Control Mode, Volume Control Mode, SIMV/PS mode, or Pressure Support Mode with Apnea Ventilation OFF:

- If 15 seconds pass and a valid breath is not detected (30 seconds in SIMV/PS mode with Freq set below 6), the Caution message APNEA FLOW!! appears in the Alarm window, and an intermittent audible alarm sounds.
- If an additional 15 seconds pass (30 seconds total) and a valid breath is not detected (an additional 30 seconds (60 seconds total) in SIMV/PS mode with Freq set below 6), the Caution message APNEA FLOW!! is upgraded to a Warning in the Alarm window, and a continuously repeating audible alarm sounds.

When a valid breath is detected, alarm annunciation ceases and a tidal volume measurement appears in the display window.

When the system is in ManSpont Mode or Pressure Support Mode with Apnea Ventilation ON:

- The Caution condition does not occur until 30 seconds have elapsed without a valid breath.
- The Warning condition does not occur until 60 seconds have elapsed without a valid breath.

When a valid breath is detected, alarm annunciation ceases and a tidal volume measurement appears in the display window.

APNEA VENTILATION (Caution)

If two consecutive Apnea Ventilation breaths occur, the Caution message APNEA VENTILATION !! appears in the Alarm window.

EXP PORT LEAKAGE (Caution)

Expiratory volume during inspiration is greater than 15 mL.
MINUTE VOLUME HIGH (Caution)
Whenever the Fabius GS measures a minute volume higher than the high minute volume alarm limit, the Caution message MINUTE VOLUME HIGH!! appears in the Alarm window, and an intermittent audible alarm sounds.

MINUTE VOLUME LOW (Caution)
Whenever the Fabius GS measures a minute volume less than the low minute volume alarm limit, the Caution message MINUTE VOLUME LOW!! appears in the Alarm window, and an intermittent audible alarm sounds.

FLOW SENSOR CAL DUE (Advisory)
The FLOW SENSOR CAL DUE! advisory message appears in the Alarm window if it has been longer than 18 hours since the flow sensor has been calibrated, or if the cable has been removed and reconnected.

FLOW SENSOR FAIL (Advisory)
The FLOW SENSOR FAIL! advisory message appears in the Alarm window if the sensor cable is not properly connected to the interface panel, or if there is an internal sensor fault.

VOLUME ALARMS OFF (Advisory)
Volume alarms disabled by the operator.

Respiratory Volume Monitoring Problem Resolution

Table 4. Respiratory Volume Monitoring Problem Resolution

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank display area, FLOW SENSOR FAIL! alarm message in Alarm window</td>
<td>Sensor cable is disconnected.</td>
<td>Reconnect sensor cable to sensor at breathing system.</td>
</tr>
<tr>
<td></td>
<td>Sensor fault</td>
<td>Replace sensor assembly.</td>
</tr>
<tr>
<td>Inaccurate data displayed</td>
<td>Flow sensor signal drift</td>
<td>Calibrate the sensor.</td>
</tr>
<tr>
<td></td>
<td>Desflurane compensation setting not consistent with actual agent delivered</td>
<td>Activate or deactivate &quot;Des Comp&quot; as appropriate.</td>
</tr>
<tr>
<td></td>
<td>External agent analyzer providing inaccurate data through the communications port.</td>
<td>Check agent analyzer. Check communications cable. Disconnect analyzer from the Fabius GS and set &quot;Des Comp&quot; appropriately.</td>
</tr>
</tbody>
</table>
Breathing Pressure Monitoring

Breathing Pressure Monitoring Displays

Information about the patient’s breathing pressure is presented in the Breathing Pressure Monitor Window (1 in Figure 105) and in the Breathing Pressure Trace Window (2 in Figure 105).

The Breathing Pressure Monitor window contains breathing pressure measurements expressed in units of cmH2O as well as the pressure high and pressure threshold alarm limits. The measurement units are selected via the Configuration screen (see “Configuration” on page 119).

Note: The Fabius GS can be configured by your Local Authorized Service Organization to display mean pressure (MEAN) instead of plateau pressure (PLAT).

The following numbers in boldface refer to Figure 106.

- **1 - PEEP (Positive End Expiratory Pressure)**
  The breathing pressure at the end of exhalation. The numeric data display range is from 0 to 30.

- **2 - PLAT (Plateau) Breathing Pressure**
  The breathing pressure at the end of inspiration. The numeric data display range is from 0 to 80.

- **2 - MEAN Breathing Pressure**
  The average of all the instantaneous pressure values recorded during each breath. The numeric data display range is from 0 to 50.

- **3 - PEAK Breathing Pressure**
  The highest instantaneous pressure value for each breath. The numeric data display range is from 0 to 80.

- **4 - Pressure High Alarm Limit**

- **5 - Pressure Threshold Alarm Limit**

- **6 - Breathing Pressure Trace Window**
  This large window displays a breathing pressure trace, or waveform.

- **7 - Breathing Pressure Threshold Limit Line**

- **8 - Breathing Pressure Minimum and Maximum Trace Scale Limits Indicator**
  Pressure measurements are displayed in units of cmH2O and are automatically scaled from 0-20, 0-50, or 0-100 cmH2O.
Breathing Pressure Monitor Controls

The following numbers in boldface refer to Figure 107.

The Alarm Limits key (1) and the rotary knob (2) enable you to set breathing pressure alarm limits.

While the ventilator is on, apnea pressure alarms are generated if the breathing pressure monitor does not sense a valid breath for a specified period of time (see “APNEA PRESSURE (Warning/Caution)” on page 95).

While the ventilator is off and the system is in ManSpont mode, these alarms are generated at 30 seconds (Caution) and 60 seconds (Warning).

Setting the Pressure and Threshold Alarm Limits

At power-up and when you press the Restore Default Settings key on the Standby screen, the breathing pressure high and pressure threshold alarm limits are automatically set to their default settings. You can adjust these limits within specified ranges.

Pressure Threshold Alarm Limit

The Pressure Threshold Limit range is from 5 to 30 cmH₂O.

Factory default value: 8 cmH₂O.

The pressure threshold alarm limit defines the level below which an apneic alarm condition exists. When the patient’s breathing pressure falls below the threshold limit for a specified period (see “APNEA PRESSURE (Warning/Caution)” on page 95), a message appears in the Alarm window and an audible alarm sounds.

Note: The pressure threshold alarm limit should be as close as possible to the sensed plateau pressure without exceeding it, approximately 4 cmH₂O below the plateau pressure.

Procedure

See “Alarms” on page 81 to change the pressure high alarm limit.
Breathing Pressure Monitoring

Breathing Pressure Alarm Messages

The following list contains all warning, caution and advisory alarms associated with breathing pressure monitoring.

PRES APNEA ALARM OFF

The apnea pressure alarm is disabled (in ManSpont only).

APNEA PRESSURE (Warning/Caution)

When the system is in Pressure Control Mode, Volume Control Mode, SIMV/PS Mode with Freq set to 6 or above, or Pressure Support Mode with Apnea Ventilation OFF:

• If the measured breathing pressure does not cross the pressure threshold alarm limit for more than 15 seconds, the Caution message APNEA PRESSURE!! appears in the Alarm window and an intermittent audible alarm sounds.

• If the breathing pressure does not cross the pressure threshold for an additional 15 seconds (30 seconds total), the Caution message APNEA PRESSURE!! is upgraded to a Warning in the Alarm window (APNEA PRESSURE!!!), and a continuously repeating audible alarm sounds.

When the system is in ManSpont Mode, SIMV/PS Mode with Freq set below 6, or Pressure Support Mode with Apnea Ventilation ON:

• The Caution condition does not occur until 30 seconds have elapsed without a valid breath.

• The Warning condition does not occur until 60 seconds have elapsed without a valid breath. During apneic conditions, the respiratory pressure measurements disappear after 60 seconds. When a valid breath is detected, alarm annunciation ceases and a tidal volume measurement appears in the display window.

Note: When the system is in ManSpont Mode, the APNEA PRESSURE alarm defaults to OFF.

CONTINUOUS PRESSURE (Warning)

If the measured breathing pressure remains above the pressure threshold alarm limit for more than 15 seconds, the breathing pressure display area is cleared, the Warning message CONTINUOUS PRESSURE!! appears in the Alarm window, and a continuous audible alarm sounds.
When the measured breathing pressure drops below the pressure threshold alarm limit, alarm annunciation ceases.

**AIRWAY PRESSURE HIGH (Warning)**

If the measured breathing pressure exceeds the high pressure limit, the Warning message AIRWAY PRESSURE HIGH!!! appears in the Alarm window and a continuously repeating audible alarm sounds.

This alarm condition is cleared when the measured breathing pressure drops below the high pressure alarm limit. However, the alarm message is extended for 10 seconds to allow for a momentary high pressure condition.

**PRESSURE NEGATIVE (Warning)**

If the measured breathing pressure falls below -5 cmH₂O or mean pressure falls below -2 cmH₂O, the Warning message PRESSURE NEGATIVE!!! appears in the Alarm window and a continuously repeating audible alarm sounds.

This alarm condition is cleared when the sensed pressure rises above -5 cmH₂O or above a mean pressure of -2 cmH₂O. However, the alarm message is extended for 10 seconds to allow the recognition of a momentary subatmospheric pressure condition.

**EXP PRESSURE HIGH (Caution)**

During Volume or Pressure Ventilation (Caution) Any time that the monitor measures a PEEP of more than 4 cmH₂O over the PEEP setting, the Caution message EXP PRESSURE HIGH!! appears in the Alarm window and an intermittent audible alarm sounds.

**PEEP HIGH (Advisory)**

During ManSpont Mode (Advisory) Alarm annunciation occurs when the measured PEEP is greater than 4 cmH₂O.

**INSP PRES NOT REACH (Advisory)**

Any time that PINSP pressure is not reached in Pressure mode, Pressure Support mode, or SIMV/PS mode, the Advisory message INSP PRES NOT REACH! appears in the Alarm window.
PRESSURE SENSOR FAIL (Advisory)

If the Fabius GS detects a faulty or miscalibrated sensor, the Advisory message PRESSURE SENSOR FAIL! appears in the Alarm window. If this happens, call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).

PRESSURE LIMITING (Advisory)

Any time that the monitor detects pressure greater than or equal to the PMAX setting, Advisory message PRESSURE LIMITING! appears in the Alarm window. This advisory can only occur when the ventilator is in Volume Control mode.

PRES THRESHOLD LOW (Advisory)

The Advisory message PRES THRESHOLD LOW appears in the Alarm window any time the sensed plateau pressure exceeds the threshold pressure alarm limit by more than 6 cmH₂O at threshold pressure alarm limit settings of 5–20 cmH₂O, or by more than 8 cmH₂O at threshold pressure alarm limit settings of 21–29 cmH₂O. Setting the threshold pressure alarm limit at 30 cmH₂O disables the PRES THRESHOLD LOW advisory.

Problem Resolution

Table 5. Breathing Pressure Monitoring Problem Resolution

<table>
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<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pressure readout in display area during ventilation</td>
<td>Pilot line not connected.</td>
<td>Make sure pilot line is properly connected.</td>
</tr>
<tr>
<td></td>
<td>Pilot line blocked or kinked.</td>
<td>Make sure that lumen of pilot line is free of obstructions.</td>
</tr>
<tr>
<td>Erratic readings</td>
<td>Condensation accumulation in pilot line.</td>
<td>Drain and reconnect pilot line.</td>
</tr>
</tbody>
</table>
# Setup Window (Used During Operation)

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<tr>
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</tbody>
</table>
Overview

This chapter describes the monitoring and ventilation functions available in the Setup window, which can be used in Volume Control, Pressure Control, and ManSpont mode.

The Setup window enables you to

- perform ventilation functions and
- view and change monitoring settings for the current operation.

**Note:** To set default monitoring settings to be used at the power-up of each operation, see "Standby Setup Screen" on page 113.

Setup Window Access

Press the Setup key (1 in Figure 108) while the ventilator is in Volume Control, Pressure Control, Pressure Support, SIMV/PS, or ManSpont ventilation mode.

The Setup window (1 in Figure 109) replaces the Waveform area and the soft key labels (2 and 3 in Figure 108).

The following soft key labels appear in the Setup window:

- Volume Alarms On/Off
- Auto Set
- Calibrate O2 Sensor
- Des Comp On/Off
- Access Alarm Log
- Access Alarm Volume

![Figure 108. Ventilation Monitor Screen and System Controls](image)

![Figure 109. Setup Window](image)
Chapter 7 - Setup Window (Used During Operation)

Volume Alarms On/Off

Press the Volume Alarms On soft key (1 in Figure 110).

“Volume Alarms On” changes to “Volume Alarms Off,” and volume alarms are disabled.

Note: The Volume Alarms On/Off soft key label does not appear in ManSpont mode because it is selectable on the ManSpont screen.

Auto Set

Press the Auto Set soft key (2 in Figure 110).

The breathing pressure threshold is set to 4 cmH₂O below the current plateau pressure data value.

Note: The threshold setting may not be less than 5 cmH₂O or greater than 30 cmH₂O.

Note: In the absence of a current plateau pressure data value, pressing the softkey will have no effect.

Note: In SIMV/PS mode, the breathing pressure threshold will be set relative to the mandatory ventilation stroke.

Calibrate O₂ Sensor

1. Press the Calibrate O₂ Sensor soft key (3 in Figure 110).

The Calibrate O₂ Sensor Instruction window (Figure 111) replaces the Setup window.

2. Follow the instructions and press the rotary knob.

The present O₂ value is replaced by “CAL” (1 in Figure 112).

Upon completion of the calibration, the O₂ concentration measurement appears.

If the O₂ sensor cannot be calibrated, replace the O₂ capsule in the O₂ sensor housing (see “Inserting A New O₂ Sensor Capsule” on page 59).

If the O₂ sensor still cannot be calibrated, call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).
Activate Desflurane Compensation

Press the Des Comp Off soft key (1 in Figure 113).

When the Des Comp Off soft key is pressed, its soft key label changes from “Des Comp Off” to “Des Comp On” (1 in Figure 114). “Des on” appears at the top of the Setup window (2 in Figure 114).

Desflurane compensation is Activated.

The Desflurane compensation state will not change when you restore site defaults or run system diagnostics.

Note: Desflurane has characteristics that affect the sensitivity of the Fabius GS flow sensor. To help assure that the volume measurements from the monitor are accurate, activate Desflurane compensation when Desflurane is used in the breathing circuit. The Fabius GS will automatically compensate for the change in flow measurement characteristics caused by the use of Desflurane.

Caution: Ensure that Desflurane compensation is only activated whenever Desflurane is used. Failure to activate when Desflurane is used will affect measured volume accuracy. Activating when Desflurane is not used will affect measured volume accuracy.

Caution: The Fabius GS will automatically compensate for Desflurane when agent concentration data is available through communication with an external agent analyzer. Inaccurate data from the analyzer may affect measured volume accuracy.

Note: If Desflurane concentration data is communicated to the Fabius GS by an external agent analyzer, the Fabius GS will automatically perform the corresponding flow compensation. In this case, the communicated data always overrides the functionality of the Desflurane compensation softkey.
Automatic Desflurane Compensation

If Desflurane concentration data is communicated to the Fabius GS by an external agent analyzer, the following occurs:

- "Des auto" appears at the top of the Setup window (1 in Figure 115),
- the Des Comp soft key label (2 in Figure 115) is removed,
- and the Fabius GS will automatically perform the corresponding flow sensor compensation.

Automatic Desflurane compensation always overrides the functionality of the Desflurane compensation soft key.

If communication is disconnected or lost between the Fabius GS and an external agent analyzer while Desflurane is in use,
- the “Des auto” label disappears from the top of the Setup window, and
- the Des Comp soft key label reappears as "Des Comp Off."

To maintain Desflurane compensation, manually activate Desflurane compensation to ensure accurate volume measurements.

Access Alarm Log

Press the Access Alarm Log soft key.

The alarm log (Figure 116) replaces the Setup window.

Turn the rotary knob to scroll down the list of alarm messages.

Note: If “Clear Alarm Log” is selected and confirmed, all alarm messages in the Alarm Log are deleted.
Access Alarm Volume

1. Press the Access Alarm Volume soft key.
   The Alarm Volume Setting window (Figure 117) replaces the Setup window.

2. Select and confirm a new alarm volume value.
   The new alarm volume value is saved and the Access Alarm Volume Setting window disappears.

Note: The value “1” is the minimum and the value of “10” is the maximum.

Window Deactivation

Once the Setup window is activated, if no rotary knob activity occurs within 15 seconds, the Setup window is deactivated and the Waveform window is activated. Another way to deactivate the Setup window and activate the Waveform window is to press the Home key.

![Figure 117. Setup Alarm Volume]
# Standby Mode Functions

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</tbody>
</table>
Overview

This chapter describes the functions that are made available in Standby mode.

Standby Screen

Access

1. Press the Standby key.

The Standby Confirmation Message and Gas Flow Control Valve Shut Off Message window (1 in Figure 118) replaces the Waveform window.

The LED associated with the Standby key starts blinking. It remains blinking until Standby is confirmed by pressing the rotary knob.

Note: If confirmation does not occur within 15 seconds, the Standby Confirmation Message and Gas Flow Control Valve Shut Off Message window are deactivated and the Waveform window is activated. The Ventilator will not be switched to Standby mode.

2. Confirm.

The Standby screen (Figure 119) replaces the previous screen.

After the Standby status is confirmed,

- The Standby key's LED is switched from blinking to constantly on, and the ventilator is switched to Standby mode.
- If fresh gas flow is detected, then the flows were not shut off before activating Standby mode and the "Gas still flowing!" alarm message will appear in the alarm window (Figure 119). Once all gas flow control valves are shut off, the flow detection alarm message disappears (Figure 120).
Chapter 8 - Standby Mode Functions

Sleep Mode
If 2.5 minutes elapse in Standby mode with no user input, SLEEP mode is activated (Figure 121). The Ventilator monitor screen is replaced by the screen saver. The Screen Saver displays a message that provides instructions on how to activate Standby mode.

Run System Test
Press the Run System Test soft key.
The system diagnostics is performed (Figure 122). After successful completion, the system switches to the Standby screen.

Calibrate Flow Sensor
1. Press the Calibrate Flow Sensor soft key.
   The Calibrate Flow Sensor Instruction window replaces the Standby screen soft key labels (Figure 123).
2. Follow the instructions.
   The Calibrate Flow Sensor in Progress bar replaces the instruction window (Figure 124).
3. Upon completion of the calibration, the “Flow Sensor Calibration completed” message (Figure 125) or the “Flow Sensor Calibration FAILED” message (Figure 126 on page 110) appears.

Flow Sensor Calibration Failed - Troubleshooting
If the Flow sensor can not be calibrated, retry the calibration.
If the Flow sensor still can not be calibrated, call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).
Standby Screen

Calibrate O2 Sensor

1. Press the Calibrate O2 Sensor soft key.
   The Calibrate O2 Sensor Instruction window replaces the Standby screen soft keys (Figure 127).

2. Follow the instructions.
   The Calibrate O2 Sensor in Progress bar replaces the instruction window (Figure 128).

3. Upon completion of the calibration, the “O2 Sensor Calibration completed” message (Figure 129) or the “O2 Sensor Calibration FAILED” message (Figure 130) appears.

O2 Sensor Calibration Failed - Troubleshooting

If the O2 sensor can not be calibrated, replace the O2 capsule in the O2 sensor housing (see "Inserting A New O2 Sensor Capsule" on page 59).

If the O2 sensor still can not be calibrated, call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).

Leak / Compliance Test

1. Press the Leak / Compl Test soft key.
   The Leak / Compl Test Ventilator Preparation message replaces the Standby screen (Figure 131), followed by the Leak / Compl Test Instruction screen (Figure 132).

2. Follow the instructions on the Leak / Compl Test Instruction screen.
   Upon completion of the instructions, the Leak / Compl Test Results screen appears (Figure 133 on page 112).
Access Alarm Log

1. Press the Access Alarm Log soft key.
   The Alarm Log appears (Figure 134).
2. Turn the rotary knob to scroll through the Alarm Log.

When the "Clear Alarm Log" is selected and confirmed, all alarms in the Alarm Log are deleted.

Restore Site Defaults

Press the Restore Site Defaults soft key. The pre-defined site default settings are restored, and the "Default settings restored" message appears (Figure 135).

Site default settings are set in the Standby Setup screen.

Figure 133. Leak / Compliance Test Results Screen

<table>
<thead>
<tr>
<th>Date</th>
<th>Ventilator Leak</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/11/02</td>
<td>72</td>
<td>2.12</td>
</tr>
<tr>
<td>07/11/02</td>
<td>76</td>
<td>2.12</td>
</tr>
<tr>
<td>07/11/02</td>
<td>78</td>
<td>2.13</td>
</tr>
<tr>
<td>07/11/02</td>
<td>Failed</td>
<td>Failed</td>
</tr>
<tr>
<td>07/11/02</td>
<td>72</td>
<td>2.09</td>
</tr>
</tbody>
</table>

Press rotary knob to exit

Figure 134. Standby Screen Alarm Log

To start operation press one of the keys located to the left of the display

SW 3.00
DC28

08/13/04 Vent Leak 10 nL/min Compl 1.50 nL/cmH20

08/13/04 Vent Leak 10 nL/min Compl 1.50 nL/cmH20

Figure 135. Site Defaults Restored Bar

Site Default settings restored

Run System  Calibrate Flow Sensor  Calibrate O2 Sensor  Leak / Compl Test  Access Alarm Log  Restore Site Defaults
Standby Setup Screen

In Standby mode, press the Setup key.

The Standby Setup screen (Figure 136) replaces the Standby Screen.

The cursor, which appears over “Default Settings,” enables you to select “Default Settings” or “Configuration”.

Default Settings

Select and confirm “Default Settings.”

The Default Settings column is selected (Figure 137).

If the return arrow (1 in Figure 137) is selected and confirmed, the Default Settings column is deselected and “Default Settings” is selected (Figure 136).

The Default Settings Items are:

- Volume Settings
- Pressure Settings
- Pressure Support Settings
- SIMV/PS Settings
- Alarm Limits
- Alarm Volume
- Restore Factory Defaults

Figure 136. Standby Setup Screen

<table>
<thead>
<tr>
<th>Standby Setup</th>
<th>Configuration</th>
<th>Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Settings</td>
<td>Exit</td>
<td>Exit</td>
</tr>
<tr>
<td>Exit</td>
<td>Volume Settings</td>
<td>Time Set</td>
</tr>
<tr>
<td>Pressure Settings</td>
<td>Time Format</td>
<td></td>
</tr>
<tr>
<td>Pressure Support Settings</td>
<td>Date Set</td>
<td></td>
</tr>
<tr>
<td>SIMV/PS Settings</td>
<td>Date Format</td>
<td></td>
</tr>
<tr>
<td>Alarm Limits</td>
<td>Acoustic Confirmation</td>
<td></td>
</tr>
<tr>
<td>Alarm Volume</td>
<td>Alarm Tone Sequence</td>
<td></td>
</tr>
<tr>
<td>Restore Factory Defaults</td>
<td>Waveform Display</td>
<td></td>
</tr>
</tbody>
</table>

Figure 137. Standby Setup Screen Default Settings Selected

<table>
<thead>
<tr>
<th>Standby Setup</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Settings</td>
<td>1</td>
</tr>
<tr>
<td>Exit</td>
<td>Volume Settings</td>
</tr>
<tr>
<td>Pressure Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Support Settings</td>
<td></td>
</tr>
<tr>
<td>SIMV/PS Settings</td>
<td></td>
</tr>
<tr>
<td>Alarm Limits</td>
<td></td>
</tr>
<tr>
<td>Alarm Volume</td>
<td></td>
</tr>
<tr>
<td>Restore Factory Defaults</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 8 - Standby Mode Functions

Volume Settings
1. Select and confirm "Volume settings."
   The Default Volume Settings window appears along the bottom of the Standby Setup screen (Figure 138).

2. Press a soft key (ex., P MAX in Figure 139).
   The cursor appears over the setting for the selected soft key.

3. Select and confirm a new setting value (ex., in Figure 139, the setting value was changed from 40 to 50).
   The Standby Setup screen instructs you to confirm the new default setting (Figure 140).

4. Repeat steps 2 and 3 for setting other parameter values.

5. Confirm the new default setting.
   The Default Volume Ventilator Settings window disappears, and the cursor appears over the return arrow.

Pressure Settings, Pressure Support, and SIMV/PS Settings
Use the process example in "Volume Settings" to change the parameters associated with each ventilator mode.
Standby Setup Screen

Alarm Limits

1. Select and confirm “Alarm Limits.”

The Default Alarm Limits window appears (Figure 141).

2. Select and confirm the desired alarm limit (Figure 142).

3. Select a new setting value (ex., in Figure 143, the setting value was changed from 30 to 25).

4. Confirm the new setting value.

The new setting is saved and the cursor appears over the return arrow.

5. Repeat steps 2 through 4 for setting other setting values.

Figure 141. Standby Setup Screen Default Alarm Limits

<table>
<thead>
<tr>
<th>Standby Setup</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Settings</td>
<td></td>
</tr>
<tr>
<td>Exit</td>
<td></td>
</tr>
<tr>
<td>Volume Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Support Settings</td>
<td></td>
</tr>
<tr>
<td>SIMU/PS Settings</td>
<td></td>
</tr>
<tr>
<td><strong>Alarm Limits</strong></td>
<td></td>
</tr>
<tr>
<td>Alarm Volume</td>
<td></td>
</tr>
<tr>
<td>Restore Factory Defaults</td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
</tbody>
</table>

Select alarm limit and press rotary knob to confirm

Figure 142. Standby Setup Screen Default Alarm Limits Select

<table>
<thead>
<tr>
<th>Standby Setup</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Settings</td>
<td></td>
</tr>
<tr>
<td>Exit</td>
<td></td>
</tr>
<tr>
<td>Volume Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Support Settings</td>
<td></td>
</tr>
<tr>
<td>SIMU/PS Settings</td>
<td></td>
</tr>
<tr>
<td><strong>Alarm Limits</strong></td>
<td></td>
</tr>
<tr>
<td>Alarm Volume</td>
<td></td>
</tr>
<tr>
<td>Restore Factory Defaults</td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
</tbody>
</table>

Select alarm limit and press rotary knob to confirm

Figure 143. Standby Setup Screen Default Alarm Limits Confirm

<table>
<thead>
<tr>
<th>Standby Setup</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Settings</td>
<td></td>
</tr>
<tr>
<td>Exit</td>
<td></td>
</tr>
<tr>
<td>Volume Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Support Settings</td>
<td></td>
</tr>
<tr>
<td>SIMU/PS Settings</td>
<td></td>
</tr>
<tr>
<td><strong>Alarm Limits</strong></td>
<td></td>
</tr>
<tr>
<td>Alarm Volume</td>
<td></td>
</tr>
<tr>
<td>Restore Factory Defaults</td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Set</strong></td>
<td></td>
</tr>
</tbody>
</table>

To confirm new O2 alarm limit press rotary knob
Chapter 8 - Standby Mode Functions

Setting Alarm Limit Defaults

When the anesthesia machine is started, it uses the default alarm limit values that were established the last time the machine was configured. These values can be viewed and changed in the Alarm Limit window.

The Alarm Limit window is deactivated if the rotary knob is not used within 15 seconds, if the Alarm Limit key is pressed again, or if any other key is pressed.

Alarm Variables

- **Oxygen High Limit** — The Oxygen High Alarm Limit range is from 19% to 100%. It is not possible to set the Oxygen High Limit setting to less than or equal to the Oxygen Low Limit.
  
The factory default value for Oxygen High Limit is 100%.

- **Oxygen Low Limit** — The Oxygen Low Alarm Limit range is from 18% to 99%. It is not possible to set the Oxygen Low Limit setting to equal to or greater than the Oxygen High Limit.
  
The factory default value for Oxygen Low Limit is 20%.

- **Minute Volume High Limit** — The Minute Volume High Limit range is from 0.1 L/min. to 20.0 L/min.
  
The factory default value is 12.0 L/min.

- **Minute Volume Low Limit** — The Minute Volume Low Limit range is from 0.0 L/min. to 19.9 L/min.
  
The factory default value is 3.0 L/min.

- **Pressure High Limit** — The Pressure High Limit range is from 10 to 70 cmH₂O.
  
The factory default value is 40 cmH₂O.

- **Apnea Pressure Threshold** — The Apnea Pressure Threshold Limit range is from 5 to 30 cmH₂O.
  
The factory default value is 8 cmH₂O.
Alarm Volume

1. Select and confirm “Alarm Volume.” The Default Alarm Volume Setting window appears next to “Alarm Volume” (Figure 144).

2. Select and confirm a new alarm volume value (ex., in Figure 145, the value is changed from “4” to “5”). The new alarm volume value is saved and the Default Alarm Volume Setting window disappears.

Note: The value “1” is the minimum and the value of “10” is the maximum.
Chapter 8 - Standby Mode Functions

Restore Factory Defaults

1. Select and confirm “Restore Factory Defaults.”
   
The Restore Factory Defaults Setting window appears next to “Restore Factory Defaults” (Figure 146).

2. Select and confirm “Yes” or “No.”
   
   When “Yes” is selected and confirmed, the factory defaults are restored and replace the Default Settings.

The factory default settings:

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

- Δ PPS = 10
- Freq Min = 3
- Trigger = 2
- Insp Flow = 30
- PEEP = 0

SIMV/PS

- PMAX = 40
- Vt = 600
- Freq = 12
- Δ PPS = 10
- PEEP = 0
- Trigger = 2
- Insp Flow = 30
- Ti = 1.7
- TIP : TI = 10

Alarm Default Settings for O₂

- High = 100
- Low = 20

Figure 146. Restore Factory Defaults

<table>
<thead>
<tr>
<th>Standby Setup</th>
<th>Exit →</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Settings</td>
<td></td>
</tr>
<tr>
<td>Pressure Support Settings</td>
<td></td>
</tr>
<tr>
<td>SIMV/PS Settings</td>
<td></td>
</tr>
<tr>
<td>Alarm Limits</td>
<td></td>
</tr>
<tr>
<td>Alarm Volume</td>
<td></td>
</tr>
<tr>
<td>Restore Factory Defaults</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Select and press rotary knob to confirm
Standby Setup Screen

Alarm Default Settings for MV
- High = 12.0
- Low = 3.0

Alarm Default Settings for Pressure
- High = 40
- Threshold = 8

Alarm Audio Volume = 5

Configuration
Select and confirm “Configuration.”
The Configuration column is selected (Figure 147).

If the return arrow is selected and confirmed, the Configuration column is de-selected and “Configuration” is selected.
The Configuration Items are:
- Time Set
- Time Format
- Date Set
- Date Format
- Acoustic Confirmation
- Alarm Tone Sequence
- Waveform Display

Time Set
1. Select and confirm “Time Set.”
The Time Set window appears to the right of “Time Set” and the cursor appears over the hour field (Figure 148).

Figure 147. Standby Setup Screen Configuration Settings Selected

Figure 148. Standby Setup Screen Configure Time Hour Select

Select time and press rotary knob to confirm
Chapter 8 - Standby Mode Functions

2. Select and confirm a new hour time value (ex., in Figure 149, the value is changed from “13” to “20”).
   
   The cursor moves over the minute field (Figure 150).

3. Select and confirm a new minute time value (ex., in Figure 150, the value is changed from “15” to “30”).
   
   The new time values are saved, the Time Set window disappears, and the cursor in the Configuration column appears over “Time Set.”

Note: This three-step process also applies to “Date Set” on page 122.
**Time Format**

1. Select and confirm “Time Format.”

   The Time Format window appears to the right of “Time Format” and the cursor appears over the default time format value (Figure 148).

2. Select and confirm a new time format value (ex., in Figure 149, the value is changed from “24:00 Hour” to “AM/PM”).

   The new format value is saved, the Time Format window disappears, and the cursor in the Configuration column appears over “Time Format.”

   The values that can be selected are “24 Hour” or “AM/PM.”

   **Note:** This two-step process applies to all other items in the Configuration column except for “Time Set” and “Date Set.”

---

**Figure 151. Standby Setup Screen Configure Time Format**

<table>
<thead>
<tr>
<th>Standby Setup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
</tr>
<tr>
<td>Exit</td>
</tr>
<tr>
<td>Time Set</td>
</tr>
<tr>
<td>Time Format</td>
</tr>
<tr>
<td>Date Set</td>
</tr>
<tr>
<td>Date Format</td>
</tr>
<tr>
<td>Acoustic Confirmation</td>
</tr>
<tr>
<td>Alarm Tone Sequence</td>
</tr>
<tr>
<td>Waveform Display</td>
</tr>
</tbody>
</table>

Select format and press rotary knob to confirm

---

**Figure 152. Standby Setup Screen Configure Time Hour**

<table>
<thead>
<tr>
<th>Standby Setup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
</tr>
<tr>
<td>Exit</td>
</tr>
<tr>
<td>Time Set</td>
</tr>
<tr>
<td>Time Format</td>
</tr>
<tr>
<td>Date Set</td>
</tr>
<tr>
<td>Date Format</td>
</tr>
<tr>
<td>Acoustic Confirmation</td>
</tr>
<tr>
<td>Alarm Tone Sequence</td>
</tr>
<tr>
<td>Waveform Display</td>
</tr>
</tbody>
</table>

Select format and press rotary knob to confirm
Chapter 8 - Standby Mode Functions

Date Set
The values that can be selected are numerical values applicable to day, month, and two-digit year.

Date Format
The values that can be selected are “MM-DD-YY” or “DD-MM-YY.”

Acoustic Confirmation
The values that can be selected are “On” and “Off.” If “On” is selected, an acoustic confirmation is announced every time that the rotary knob is pressed.
Standby Setup Screen

Alarm Tone Sequence
The values that you can select are “Dräger” and “EN 740.”

Waveform Display
The values that you can select are “Normal” and “Filled.”
If “Normal” is selected, the waveform is not filled with a solid pattern, but appears as a line (1 in Figure 158).

Figure 156. Standby Setup Screen Alarm Tone Sequence Select

Figure 157. Standby Setup Screen Waveform Display

Figure 158. Normal Waveform Display
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   Dismantling the APL-Valve .................................................. 128
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Routine Maintenance

Routine maintenance must be performed regularly to ensure safe and effective operation. Regularly check the condition of the absorbent and the overall condition of the machine, power cord, hoses, and breathing bag.

Disassembling

Preparing the Compact Breathing System

1. Leave the Dräger Vapor(s) on the machine.
2. Remove all breathing hoses.
3. Remove the breathing bag.
4. Remove the ventilation hose.
5. Remove the fresh gas hose from the breathing system.
6. Remove the anesthetic scavenging hose.
7. Detach the APL-bypass and the Peep/Pmax lines from the breathing system and from the side of the machine.
8. Remove the flow sensor cable.
9. Remove the O2 sensor cable.
10. Turn off the optional Heated Breathing System Power Supply (HBSPS) power and disconnect the HBSPS power cable from the breathing system.
11. Remove the compact breathing system.

Dismantling the Inspiratory Valve

1. Unscrew the retaining nut.
2. Remove the inspection cap.
3. Extract the valve disc.

Dismantling the Expiratory Valve

1. Unscrew the retaining nut.
2. Remove the inspection cap.
3. Extract the valve disc.

Dismantling the Flow Sensor

1. Loosen fitting on the expiration port.
2. Extract the flow sensor.
Dismantling the APL-Valve
1. Unscrew the retaining nut.
2. Remove the APL-valve.
3. Unscrew the waste gas outlet port.

Dismantling the Absorbent Canister
1. Turn the absorber counter-clockwise and remove by pulling down.
2. Empty the expired CO₂ absorbent from the absorber into an appropriate refuse container.

*Warning:* Absorbent is caustic and is a strong irritant to the eyes, skin, and respiratory tract. When replacing the absorbent, take care not to spill its caustic contents.
3. Fill the absorber with fresh CO₂ absorbent.
4. Ensure that no CO₂ absorbent dust/particles have been deposited between the gaskets and sealing surfaces. Such dust and particles can cause leaks in the system.

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

Dismantling Parts of the Ventilator
The following numbers in boldface refer to Figure 159.
1. Swing out the ventilator door (1).
2. Disconnect the ventilator chamber pressure sensor line (2) from the ventilator chamber pressure sensor line port (3).
3. Unlock the three clasps (4) to remove the cover (5).
4. Remove the diaphragm (6).
Disinfecting/Cleaning/Autoclaving

Clean and autoclave the Fabius GS Anesthesia Workstation and its parts according to the guidelines below. Follow your institution’s policies regarding specific methods and agents for cleaning and sterilization. Determination of the need and frequency of sterilization of any particular component is the responsibility of the user institution.

Autoclaving procedures should be performed according to procedures established by the user institution following the specific instructions provided by the manufacturer of the sterilizing equipment or agent to be used. Such policies, procedures, and instructions should ultimately be consistent with established principles of clinical microbiology and infection control.

Caution: The exterior and certain other components of the anesthesia workstation consist of materials that are sensitive to certain organic solvents sometimes used for cleaning and disinfecting (e.g., phenols, halogen releasing compounds, oxygen releasing compounds, strong organic acids, etc.). Exposure to such substances may cause damage that is not always immediately apparent. Sterilization with ethylene oxide (EtO) or formaldehyde is also not permitted.

To prevent any damage, we recommend that only detergents and disinfectants are used that are compatible with the device, e.g. surface disinfectants on the basis of aldehydes, alcohols, or quarternary ammonium compounds for disinfection.

Ensure that all disinfectants are registered with the U.S. Environmental Protection Agency (or approved by your national authorities) for use as intended. Always follow the instruction labels specifically with respect to prescribed concentrations and the necessary exposure times.

Disinfectants often contain – besides their main active agents – additives that can also damage materials. When in doubt, ask the supplier/manufacturer of the disinfectant/cleaning agent.

Caution: The Fabius GS and its components must not be treated with formaldehyde vapors or ethylene oxide!

Warning: Follow all of your accepted hospital procedures for disinfecting parts contaminated with body fluids (protective clothing, eyewear, etc.).
Chapter 9 - Routine Maintenance and Cleaning Disinfecting/Cleaning/Autoclaving

Recommendations for Typical Cleaning and Disinfection After Use

A = Washing Machine (Wet pasteurisation at 70° C, 158° F, for 30 minutes after detergent cleaning)
B = Wiping (Glutaraldehyde-based formulations of 2%; ethyl or isopropyl alcohol at 70% to 90%; sodium hypochlorite (5.2% household bleach) 1:500 dilution (100 ppm free chlorine))
C = Immersion (Glutaraldehyde-based formulations of 2%)
D = Autoclaving (Including steam or hot air at 134° C, 273° F). Use your manufacturer’s or your facility’s recommendations.

Caution: Ensure that subsystems have been thoroughly aerated following cleaning and disinfection activities.

Table 6. Cleaning/Disinfection Methods for Fabius GS Anesthesia Workstation

<table>
<thead>
<tr>
<th>Components Processed</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Workstation (outside)</td>
<td></td>
</tr>
<tr>
<td>Vaporizers</td>
<td></td>
</tr>
<tr>
<td>Power cable, gas supply hoses</td>
<td></td>
</tr>
<tr>
<td>Breathing bag and hose and Y-piece</td>
<td>A</td>
</tr>
<tr>
<td>Diaphragm</td>
<td>A</td>
</tr>
<tr>
<td>Breathing system</td>
<td>A</td>
</tr>
<tr>
<td>Valve discs</td>
<td>A</td>
</tr>
<tr>
<td>Ventilator hose</td>
<td></td>
</tr>
<tr>
<td>Ventilator cover</td>
<td></td>
</tr>
<tr>
<td>APL-valve</td>
<td></td>
</tr>
<tr>
<td>Exhaust port</td>
<td></td>
</tr>
<tr>
<td>Control lines and cables (outside)</td>
<td></td>
</tr>
<tr>
<td>Expiratory port</td>
<td>A</td>
</tr>
<tr>
<td>Absorber and insert</td>
<td>A</td>
</tr>
<tr>
<td>Flow sensor (outside)</td>
<td></td>
</tr>
<tr>
<td>AGS housing</td>
<td>A</td>
</tr>
<tr>
<td>AGS flow tube (no filter)</td>
<td></td>
</tr>
<tr>
<td>AGS buffer vol. container</td>
<td></td>
</tr>
<tr>
<td>AGS transfer hose</td>
<td></td>
</tr>
</tbody>
</table>
Maintenance Intervals

Clean and disinfect the machine and components before each service (and also when returning for repair).

When Required

- Replace the O2 sensor when calibration is no longer possible.
- Replace the flow sensor when calibration is no longer possible.
- Replace the pressure-measuring line (silicone rubber hose and sleeve).
- Replace APL-bypass and PEEP and Pmax silicone rubber hoses.
- Replace the ventilator hose if it is discolored or damaged.

Every 6 Months

Inspection and service by trained service personnel. Draeger Medical, Inc. recommends DrägerService.

- Fabius GS
- Breathing systems
- Dräger Vapor
- Sensors
- Ventilator hose
- Vamos

Annually

- Replace the bacterial filter on the pressure-measuring line.
- Replace the diaphragm in the ventilator (patient).
- Replace Vapor O-Rings

After 3 Years

By trained service personnel:

- Replace the lead gel rechargeable battery for the back-up power supply.
- Replace the diaphragm and O-rings of the ventilator (piston).
- Replace breathing system canister assembly and associated seals.

Checking Readiness for Operation

Refer to “Daily and Preuse Checkout Form” in the Appendix.
Troubleshooting

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## Table 7. Alarm Message, Probable Cause, and Remedy

<table>
<thead>
<tr>
<th>Alarm Message</th>
<th>Probable Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AIRWAY PRESSURE HIGH</strong></td>
<td>Upper alarm limit for airway pressure has been exceeded, ventilation hose is kinked. Alarm limit has been set too low.</td>
<td>Check hose system on anesthesia machine. Check breathing circuit or alarm limit value.</td>
</tr>
<tr>
<td><strong>APNEA FLOW</strong></td>
<td>Breathing/ventilation stops. Leak or disconnect in breathing circuit.</td>
<td>Check ventilator. Check breathing circuit.</td>
</tr>
<tr>
<td><strong>APNEA PRESSURE</strong></td>
<td>Breathing/ventilation stops. Leak or disconnect in breathing circuit.</td>
<td>Check ventilator. Check breathing circuit.</td>
</tr>
<tr>
<td><strong>APNEA VENTILATION</strong></td>
<td>Breathing/ventilation stops. Leak or disconnect the breathing circuit. Spontaneous patient breaths are not detected by the Fabius GS. Pressure Support settings are incorrect.</td>
<td>Check ventilator. Check breathing circuit. A spontaneous patient breath is detected by the Fabius GS. Check Pressure Support settings.</td>
</tr>
<tr>
<td><strong>BATTERY LOW</strong></td>
<td>AC failure and battery &lt; 20% = Advisory AC failure and battery &lt; 10% = Caution</td>
<td>Restore mains power.</td>
</tr>
<tr>
<td><strong>CHECK APL VALVE</strong></td>
<td>APL bypass valve fault.</td>
<td>Check ventilator diaphragm and close cover. Check APL bypass valve connection for disconnect or leak. Select Standby Mode and switch back to the previous ventilation mode. Check the APL valve setting.</td>
</tr>
<tr>
<td><strong>CHECK BATTERY</strong></td>
<td>UPS is not functional.</td>
<td>Replace fuse. Call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).</td>
</tr>
<tr>
<td><strong>CONTINUOUS PRESSURE</strong></td>
<td>Breathing pressure above threshold for more than 15 seconds.</td>
<td>Check breathing circuit. If in ManSpont mode, check fresh gas flow.</td>
</tr>
<tr>
<td><strong>EXP PORT LEAKAGE</strong></td>
<td>Expiratory flow of more than 15 mL measured during inspiration.</td>
<td>Check expiratory valve and valve disk. Check tubing of expiration control line. Follow the procedure to calibrate flow sensor. Call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).</td>
</tr>
<tr>
<td><strong>EXP PRESSURE HIGH</strong></td>
<td>Peep is more than 4 cmH₂O above the Peep setting in an automatic ventilation mode.</td>
<td>Check PEEP/PMAX, etc. hoses for kinks.</td>
</tr>
<tr>
<td><strong>FLOW SENSOR CAL DUE</strong></td>
<td>More than 18 hours passed since last flow sensor calibration. Cable has been removed and reconnected.</td>
<td>Follow the procedure to calibrate flow sensor.</td>
</tr>
<tr>
<td><strong>FLOW SENSOR FAIL</strong></td>
<td>Flow sensor has not been properly calibrated. Sensor faulty.</td>
<td>Follow the procedure to calibrate sensor. Replace sensor and calibrate. Call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).</td>
</tr>
<tr>
<td><strong>FRESH GAS LOW</strong></td>
<td>Inadequate fresh-gas supply. Blocked/kinked hose. Leak or disconnect in breathing circuit.</td>
<td>Ensure adequate fresh-gas supply. Check hoses. Check breathing circuit.</td>
</tr>
<tr>
<td><strong>INSP O2 HIGH</strong></td>
<td>Inspiratory O2 concentration exceeds the upper alarm limit.</td>
<td>Check flowmeter settings and O2 high alarm limit.</td>
</tr>
<tr>
<td><strong>INSP O2 LOW</strong></td>
<td>Inspiratory O2 concentration is below the lower alarm limit.</td>
<td>Check O2 supply. Check flowmeter settings and O2 low alarm limit.</td>
</tr>
</tbody>
</table>
## Chapter 10 - Troubleshooting

<table>
<thead>
<tr>
<th>Alarm Message</th>
<th>Probable Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSPIRATORY PRESS NOT REACH</td>
<td>Set pressure not achieved while ventilating in Pressure Control, Pressure Support, or SIMV/PS mode.</td>
<td>Check ventilator, patient circuit, and Pinsp settings.</td>
</tr>
<tr>
<td>MINUTE VOLUME HIGH</td>
<td>Minute volume has exceeded upper alarm limit. Flow sensor has not been calibrated. Sensor faulty.</td>
<td>Calibrate flow sensor. Replace if necessary.</td>
</tr>
<tr>
<td>MINUTE VOLUME LOW</td>
<td>Minute volume has fallen below lower alarm limit. Blocked/kinked hose. Leak in breathing system. Reduced volume due to pressure limitation. Reduced lung compliance. Flow sensor not calibrated or faulty.</td>
<td>Check breathing circuit and alarm limit. Check breathing circuit. Check Pmax setting on ventilator control panel. Check ventilator settings. Follow the procedure to calibrate flow sensor and replace if necessary.</td>
</tr>
<tr>
<td>NO FRESH GAS</td>
<td>Inadequate fresh-gas supply. Fresh-gas control valve closed</td>
<td>Ensure adequate fresh-gas supply. Open fresh-gas control valve.</td>
</tr>
<tr>
<td>O2 SENSOR CAL DUE</td>
<td>More than 18 hours passed since last oxygen sensor calibration.</td>
<td>Follow the procedure to calibrate oxygen sensor.</td>
</tr>
<tr>
<td>O2 SENSOR FAIL</td>
<td>O2 sensor has not been correctly calibrated. O2 sensor replaced and/or not calibrated. O2 sensor used up. O2 sensor disconnected. Faulty sensor cable.</td>
<td>Follow the procedure to calibrate O2 sensor. Follow the procedure to calibrate O2 sensor. Replace sensor capsule and calibrate. Connect O2 sensor assembly. Replace O2 sensor housing assembly.</td>
</tr>
<tr>
<td>O2 SUPPLY LOW</td>
<td>O₂ supply line has less than minimum pressure permitted (approximately 20 psi).</td>
<td>Check O₂ supply and cylinder backup.</td>
</tr>
<tr>
<td>PEEP HIGH</td>
<td>Peep is higher than 4 cmH₂O in ManSpont mode.</td>
<td>Check APL-valve setting and/or fresh gas flow.</td>
</tr>
<tr>
<td>POWER FAIL</td>
<td>Mains not connected. Facility power failure.</td>
<td>Connect mains.</td>
</tr>
<tr>
<td>PRES APNEA ALARM OFF</td>
<td>Pressure alarms off in ManSpont.</td>
<td></td>
</tr>
<tr>
<td>PRESSURE LIMITING</td>
<td>Measured pressure equals or exceeds Pmax ventilator setting.</td>
<td>Check ventilator and Pmax settings.</td>
</tr>
<tr>
<td>PRESSURE NEGATIVE</td>
<td>Measured breathing pressure is less than -5 cmH₂O.</td>
<td>Check breathing circuit and ventilator settings.</td>
</tr>
<tr>
<td>PRESSURE SENSOR FAIL</td>
<td>Faulty sensor or pressure not calibrated.</td>
<td>Call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).</td>
</tr>
<tr>
<td>PRES THRESHOLD LOW</td>
<td>Ventilation parameters were changed without changing alarm settings.</td>
<td>Push the Auto Set soft key and check ventilator settings.</td>
</tr>
<tr>
<td>RS232 COM1 FAIL</td>
<td>External monitor cable disconnected from External Communication Port 1.</td>
<td>Check monitor interface cable.</td>
</tr>
<tr>
<td>RS232 COM2 FAIL</td>
<td>External monitor cable disconnected from External Communication Port 2.</td>
<td>Check monitor interface cable.</td>
</tr>
<tr>
<td>SPEAKER FAIL</td>
<td>Speaker failed.</td>
<td>Call your local Authorized Service Organization or DrägerService (see “Daily and Preuse Checkout Form” for DrägerService contact information).</td>
</tr>
</tbody>
</table>
## Alarm Message

<table>
<thead>
<tr>
<th>Alarm Message</th>
<th>Probable Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>VENTILATOR FAIL</td>
<td>Ventilator not assembled correctly.</td>
<td>Check diaphragm and close cover. Check PEEP/PMAX line for disconnect or leak. Select Standby Mode and switch back to the previous ventilation mode.</td>
</tr>
<tr>
<td>VOLUME ALARMS OFF</td>
<td>Volume alarms disabled by operator.</td>
<td></td>
</tr>
</tbody>
</table>
Components

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Front View

Figure 160. Compact Breathing System and Front of Machine

1 O₂ sensor on inspiratory valve
2 Inspiratory valve
3 APL valve
4 Airway pressure gauge
5 Dräger Vapor anesthetic agent vaporizer
6 Oxygen flush
7 Total fresh gas flowmeter
8 Ventilator
9 Ventilator control panel (settings for ventilation parameters and airway monitoring)
10 Ventilator hose
Compact Breathing System (Top View)

Figure 161. Compact Breathing System

1. Selection knob for \textbf{MAN} and \textbf{SPONT} on pressure limiting valve
2. APL Bypass valve connection port
3. PEEP/PMAX valve connection port
4. Inspiratory valve
5. Expiratory valve
6. Inspiratory port
7. Connector for breathing bag
8. Expiration port
Rear View (3-Gas Supply Connections)

Figure 162. Back of Machine (3-Gas Supply)

1 On/off switch
2 Power cable connection
3 Fuse
4 Connectors for medical gas pipeline supply (central supply)
5 Connectors for gas cylinder supply (reserve supply)
Technical Data

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Technical Data

Ambient Conditions

During operation
- Temperature: 10 to 35 °C
- Atmospheric pressure: 700 to 1060 cmH₂O
- Relative humidity: 20 to 80%

During storage
- Temperature: -10 to 60 °C
- Atmospheric pressure: 700 to 1060 cmH₂O
- Relative humidity: 10 to 90%

Machine Data

Gas supply from medical gas pipeline system
- Pipeline System Pressure Range at Machine Connector: O₂, N₂O, Air: 50 to 55 psi (3.4 to 3.8 bar)
  - Note: Pipeline system supply pressure variation shall not exceed ± 10%.
- Gas supply connectors:
  - Each inlet is fitted with a non-return valve (NIST or DISS where required)
- Pipeline Pressure Indicator Accuracy: ± 3% of full scale from 40 to 120 psi (2.7 to 8 bar)
- Piping Pressure Relief (Canada): ≤ 75 psi (520 kPa)

Gas supply from supplementary O₂ and N₂O cylinders (with pin-index connections)
- Cylinder Connections: Pin-indexed hanger yokes (CGA V-1-1994)
- Cylinder Gas Pressure (typical full loads at 70 °F, 21 °C)
  - O₂, AIR: 1900 psi (131 bar)
  - N₂O: 745 psi (51.3 bar)
- Cylinder Gauges: Conform to ASME B40.1 Grade B
- Cylinder Gauge Range
  - O₂: 0 to 3000 psi (206.8 bar)
  - N₂O: 0 to 3000 psi (206.8 bar)
  - AIR: 0 to 3000 psi (206.8 bar)

Internal Regulator Safety Relief Valve Pressure
- 70 psi

Equipment Class
- Class 1, Type B, IPX0

Ingress of Fluids
- IPX0
Chapter 12 - Technical Data

Dimensions and Weight (Approximate)

Weight:
Base unit with COSY and without supplementary cylinders and vaporizers 224 lbs. (101.6 kg)

Dimensions (with COSY)\( ^* \):
(W) 89 cm x (H) 130.8 cm x (D) 84 cm
Dimensions (without COSY):
(W) 69 cm x (H) 130.8 cm x (D) 82 cm
* Note: Width may vary with COSY arm position.

Power supply, Rating Non-configurable 100 – 240 VAC, 50/60 Hz., 2.3 A maximum

Rechargeable batteries
Rating: 24 V; 3.5 Ah
Type: sealed, gelled lead-acid
Recharging time: ≤ 16 hours on the mains or full operation time
Operation time with fully charged batteries: 45 minutes, minimum

Fuses

The following numbers in boldface refer to Figure 163.

Mains fuses:(1)
For 100-240V supply voltage:
2x T2.5AL 250V IEC 127/III

Fuses located on circuit board:
1x T1.6AL 250V IEC 127/III (2)
1x T4AL 250V IEC 127/III (3)
1x T2.5AL 250V IEC 127/III (4)

Battery fuse:
1x T3.15AL 250V IEC 127/III (5)

Electromagnetic Compatibility (EMC)

Conforming to EN 60601-1-2 and IEC 60601-1-2

The operation of this anesthetic workstation or module may be adversely affected by electromagnetic interference exceeding the levels specified in EN 60601-1-2 and IEC 60601-1-2.

Electrical Safety Conformance

Conforms to:
• UL 2601-1
• IEC 601-1
• CAN/CSA No. 601-1
• IEC 601-2-13
• EN 740
Technical Data

Ventilator

Control Inputs Ranges

- **PMAX** Pressure limiting: 15 – 70 cmH2O (1 cmH2O resolution)
  (setting must be at least 10 cmH2O above PEEP; and in SIMV/PS mode, the PMAX setting must also be greater than ∆PPS + PEEP)
- **VT** Tidal volume: 20 – 1400 mL (10 mL resolution)
- **VT (SIMV/PS)** Tidal volume: 20 – 1100 mL (10 mL resolution)
- **f** Breathing frequency: 4 – 60 bpm (1 bpm resolution)
- **Ti/Te** Inspiration/expiration ratio: 4 : 1 to 1 : 4
- **Tip/Ti** Inspiration pause: 0% - 50% (1% resolution)
- **PEEP** End-expiratory pressure: 0 - 20 cmH2O (1 cmH2O resolution)
  (setting must be at least 5 cmH2O above PEEP)
- **Pinsp** Inspiratory pressure: 5 - 65 cmH2O (1 cmH2O resolution)
- **Insp Flow** Inspiratory flow: 10 - 75 L/min (1 L/min resolution) in Pressure Control mode
  10 - 85 L/min (1 L/min resolution) in PS and SIMV/PS modes
- **∆PPS (Pressure Support)** Support Pressure: 3 - 20 cmH2O (1 cmH2O resolution)
- **∆PPS (SIMV/PS)** Support Pressure: 3 - 20 cmH2O, OFF (1 cmH2O resolution)
- **Freq Min** Apnea Ventilation minimum frequency: 3 - 20 bpm (1 bpm resolution) and “OFF”
- **Trigger** Trigger Level: 2 - 15 L/min (1 L/min resolution)
- **Tinsp** SIMV Inspiratory Time: 0.3 - 4.0 sec

Pressure Support Ventilation Mode

The Pressure Support Ventilation mode has been verified under the following range of simulated patient conditions:

- **Endotracheal Tube Size:** 4.5 mm - 8 mm
- **Patient Lung Compliance:** 10 ml/cmH2O - 100 ml/cmH2O
- **Unassisted Patient Tidal Volume:** 50 ml - 1000 ml
- **Patient Breath Rate (BPM):** 10-35

Delivery Accuracy

- **PMAX** Pressure limiting: ± 5 cmH2O of setting
- **VT** Tidal volume: ± 5% of setting or 20 mL, whichever is greater
  (discharged to atmosphere, no compliance compensation)
- **f** Breathing frequency: ± 1 bpm of setting
- **Ti/Te** Inspiration/expiration ratio: ± 5% of setting
- **Tip/Ti** Inspiration pause: ± 25% of setting
- **PEEP** End-expiratory pressure: ± 2 cmH2O* or ± 20% of setting, whichever is greater
Chapter 12 - Technical Data

High Pressure Safety Relief Valve
75 ± 5 cmH₂O

Negative Pressure Safety Relief Valve (Ambient Air Inlet Valve)
-7.5 to -9 cmH₂O

System Compliance Compensation Measurement
0.2 to 6.0 ml/cmH₂O +/- 0.2 ml/cmH₂O or +/- 10% of actual compliance, whichever is greater

Anesthesia Gas Supply Module

Fresh Gas Flow Indicators:
O₂, N₂O, Air: Range and accuracy: 0.0 to 12.0 L/min ± 10% of reading or 0.12 L/min (into an ambient atmosphere of 14.7 psi (101.3 kPa) at 20° C). Resolution: 0.1 L/min.

Fresh Gas Flow Stability:
O₂ and N₂O: ±10% of setting with pipeline pressures between 45 - 65 psi
Air ± 10% of setting with pipeline pressures between 50 - 55 psi
Air flow rate will vary proportionally with supply pressures outside 50 - 55 psi.

Total Fresh Gas Flowmeter:
Range and accuracy: 0 to 10 L/min ± 10% of full scale at STP, calibrated with 50% O₂ / 50% N₂O gas mixture
0 to 10 L/min ± 15% of full scale at STP for all other gas mixtures

Resolution:
0.5 L/min from 0.5 - 2 L/min
1.0 L/min from 2 - 10 L/min

O₂ flush (bypass):
at 55 psi (3.8 bar): max. 50 L/min
at 50 psi (3.4 bar): min. 35 L/min

Common Gas Outlet Pressure Limit: 13 psi (0.9 bar), maximum
Anesthetic Agent Vaporizer Interface

Dräger Vapor quick-change plug-in system for up to two anesthetic agent vaporizers. The connections are automatically closed and sealed when the vaporizer is removed.

Dräger Halothane Vapor
Dräger Enflurane Vapor
Dräger Isoflurane Vapor
Dräger Sevoflurane Vapor
Datex-Ohmeda Devapor/D-Tec for Desflurane
Dräger D-Vapor

See specific Instructions for Use manuals for technical data of anesthetic agent vaporizers.

<table>
<thead>
<tr>
<th>Monitoring and Measurement Display</th>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paw</td>
<td>Airway pressure (numeric) -20 to 99 cmH₂O</td>
<td>1 cmH₂O</td>
<td>±4%*</td>
<td></td>
</tr>
<tr>
<td>Paw</td>
<td>Airway pressure (wave) 0 to 99 cmH₂O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ve</td>
<td>Expiratory minute volume 0 to 99.9 L/ min</td>
<td>0.1 L/ min</td>
<td>±15%†</td>
<td>ATPS‡</td>
</tr>
<tr>
<td>Ve</td>
<td>Expiratory tidal volume 0 to 1500 mL</td>
<td>1 mL</td>
<td>±15%† or ±20 mL, whichever is greater</td>
<td>ATPS‡</td>
</tr>
<tr>
<td>f</td>
<td>Breathing frequency 2 to 99 bpm</td>
<td>±1 bpm</td>
<td>±1 bpm</td>
<td></td>
</tr>
<tr>
<td>FiO₂</td>
<td>O₂ measurement in the main gas flow 10 to 100 vol.%</td>
<td>1 vol.%</td>
<td>±3 vol.%</td>
<td>with reference to ambient pressure during calibration</td>
</tr>
<tr>
<td></td>
<td>Response time Less than 25 seconds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Service life of O₂ sensor cell &gt; 8 months at 25°C, 50% relative humidity, 50% O₂ gas mixture (or &gt; 5000% hour O₂)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Max. ± 4% of the measured value or ± 2 cmH₂O, whichever is greater.
† At standard test conditions per EN740 Annex DD and fresh gas flow = 2 times Ve.
‡ ATPS = Ambient Temperature Pressure Saturated Gas
Breathing System

<table>
<thead>
<tr>
<th>Compact Breathing System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume: 2.8 L + bag</td>
</tr>
<tr>
<td>Compliance: 0.22 mL/cm H2O*</td>
</tr>
<tr>
<td>in automatic mode (Volume Control)§</td>
</tr>
<tr>
<td>Absorber volume: 1500 mL</td>
</tr>
</tbody>
</table>

Resistance of Breathing System

<table>
<thead>
<tr>
<th>Inspiratory Resistance</th>
<th>5 L/min</th>
<th>30 L/min</th>
<th>60 L/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm H2O</td>
<td>0.5 cm H2O*</td>
<td>1.3 cm H2O*</td>
<td>2.8 cm H2O*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expiratory Resistance</th>
<th>5 L/min</th>
<th>30 L/min</th>
<th>60 L/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm H2O</td>
<td>0.7 cm H2O*</td>
<td>2.4 cm H2O*</td>
<td>4.8 cm H2O*</td>
</tr>
</tbody>
</table>

§ Compliance exclusive of patient hoses.
Note: Resistance tests in compliance with EN740-107.4.2.1
* cm H2O, Dry

Classification II b
Conforming to Directive 93/42/EEC Appendix IX

UMDNS Code 10-134
Universal Medical Device Nomenclature System

Control Inputs Ranges

<table>
<thead>
<tr>
<th>APL-Valve MAN mode</th>
<th>5 - 70 cm H2O</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPONT mode</td>
<td>1.5 cm H2O</td>
</tr>
</tbody>
</table>

Pressure Required to Open a Wet Unidirectional Valve

Moist: 1.5 cm H2O
(Tested in accordance with EN740)

Pressure Generated by a Wet Unidirectional Valve

Moist: 3.1 cm H2O (Tested in accordance with EN740)
HBPS Technical Data (Optional)

The Fabius GS can be configured with a heated breathing system to reduce condensation of moisture in the system.

**Electrical**

**AC Input Voltage and Current**

100-240 VAC, 50-60 Hz nominal, single phase, 0.6 Amps max.

**DC Output**

15Vdc ± 5%, 1.3 Amps

**Fuses**

- 2x T1.0AL 250V IEC 127/III
- 1x F1.60AH 250V IEC 127/II

**Electromagnetic Compatibility (EMC)**

Conforming to EN 60601-1-2, IEC 60601-1-2, and ANSI/AAMI/IEC 60601-1-2

**Electrical Safety Conformance**

- IEC 60601-1
- CAN/CSA C22.2 No. 601.1-M90
- UL 60601-1

**Environmental**

**Temperature**

- Operating: +10 °C to +35 °C
- Storage: -10 °C to +70 °C

**Humidity**

- Operating: 20% to 80% non-condensing
- Storage: 10% to 90% non-condensing

**Barometric Pressure**

- Operating: 700 to 1060 mbar
- Storage: 500 to 1060 mbar
Chapter 12 - Technical Data

Low Oxygen Supply Pressure Alarm

<table>
<thead>
<tr>
<th>Alarm limit</th>
<th>Warning signal when the pressure drops below 20 ± 4 psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm signal</td>
<td>High priority alarm (Warning)</td>
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<tr>
<td>LED indicator</td>
<td>The red LED indicator in the O₂ area of the gas flow control interface will flash until the O₂ supply is restored.</td>
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</table>

S-ORC (Sensitive Oxygen Ratio Controller)

S-ORC is a control element which guarantees a minimum O₂ concentration in the fresh gas flow. As from a flow rate of approx. 200 mL/min., the N₂O concentration in the fresh gas can be freely set between 0 and 75%.

During O₂ shortage

S-ORC limits the N₂O concentration in the fresh gas, so that the O₂ concentration does not drop below 23 vol.%. 

N₂O metering valve open and O₂ metering valve closed or O₂ flow less than 0.2 L/min

S-ORC prevents N₂O flow

During N₂O failure

O₂ may still be administered. No alarm.

Serial Interface

Type: RS - 232
Baud Rates: 4800, 9600, 19.2K
Parity: Odd, Even, None
Data Bits: 7 or 8
Stop Bits: 1 or 2
Protocol: Vitalink. Medibus
Diagrams

Figure 164. Gas flow diagram (Compact Breathing System)
Figure 165. Schematic Diagram of Internal Gas Flow

* Note: The check valve is not installed on the Canadian machine.
## Daily and Preuse Checkout Form

Before operating the Fabius GS, the following checkout verification form must be completed to ensure that the machine is ready for use. Do not insert any additional components into or modify the anesthesia system after the checkout procedure is started.

This is a recommended procedure. Follow your institution’s policies for specific checkout procedures.

**Caution:** If any check cannot be carried out satisfactorily, the machine must not be used.

Call your local Authorized Service Organization or DrägerService at:

**DrägerService**
Draeger Medical, Inc.
3122 Commerce Drive
Telford, PA 18969
Tel: (215) 721-5402
(800) 543-5047
Fax: (215) 721-5784
Please note that this Daily Pre-use check list takes into consideration all possible configurations of the Fabius GS. The clinician need only use those areas that apply to their specific Fabius GS configuration.

All checks must be carried out daily before equipment is used. The person who carries out the checks must be fully conversant with the Instruction for Use. Checks marked with a P must be carried out before each patient use. These pages should be removed and copied to establish a daily record of machines checks. Mark each function when checks have been satisfactorily completed.

---

**Fabius GS Serial Number**

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**Pre-conditions**

- Inspection intervals for machine and accessories are current
- P Machine fully assembled and connected
  - Monitors (O2, P, V, CO2, anesthetic agent) (when present) switched on and functioning, self test carried out satisfactorily
  - System diagnostics for Fabius GS carried out
- P Sampling line for gas monitoring (when present) connected to Luer lock on the Y-piece, correct anesthetic agent selected
- P Desflurane vaporizer (when being used) powered on

---

**Checking Reserve Power**

- P Verify that battery is fully charged. (If the battery does not show full a charge, the battery operation time is not guaranteed to be 45 minutes.)

---

**Checking the Medical Gas Connections**

- Visually inspect all gas supplies from the medical gas pipeline system and cylinders to make sure that they connect properly and fit securely.
- Verify that all medical gas pipeline supplies are within acceptable pressure ranges.
- Open reserve gas cylinders (when present).
- O2 pressure more than 1000 psi (70 bar)
- N2O pressure greater than 600 psi (43 bar) if present
- Air pressure greater than 1000 psi (70 bar) if present
- Close reserve gas cylinders.

---

**O2 Flush Function**

- Press O2 flush: A strong flow of gas should be emitted from the patient connection.
- Release O2 flush button: flow of gas from patient connection stops.
Appendix - Daily and Preuse Checkout Form

Checking the Flow Control/Metering System

☐ Activate ManSpont mode.

☐ Fully open the O2 metering valve. O2 flow of at least 10 L/min present.

☐ Fully open the N2O metering valve. N2O flow of at least 10 L/min present.

☐ Turn off the O2 supply. Remove the O2 connector and close the O2 cylinder valve.

☐ The O2 Low Supply Pressure Alarm LED is blinking. N2O does not flow.

☐ Restore the O2 supply: N2O flow is present.

☐ Set O2 metering valve to 1.5 L/min. N2O flow = 3 L/min to 5 L/min

☐ Close the O2 metering valve: No N2O flow.

☐ Open the AIR flow control valve. Air flow of at least 10 L/min present.

☐ Close all metering valves.

Sensor Calibration

☐ Remove O2 sensor housing from inspiratory valve dome

☐ Calibrate O2 sensor

☐ Calibrate flow sensor

☐ Replace O2 sensor

Checking the Gas Type

☐ Set the O2 metering valve to approx. 3 L/min.

☐ Verify an O2 concentration indication of approx. 100 vol. %.

☐ Close O2 metering valve.

Vapor 19.n, Vapor 2000 (Tec 5)

☐ Fastening; Latched down firmly and set vertically

☐ Handwheel; In zero position and engaged

☐ Filling level between min. and max.

☐ Interlock; Locking function OK (when present)

☐ Key-indexed filling system; Sealing key or pin inserted and closed tight. (when present)

☐ Filler opening locked shut.

☐ Quik Fil or Funnel filling system; Locking screw tight (when present)

Desflurane Vaporizer (when present)

☐ Fastening; Latched down firmly and set vertically

☐ Handwheel; In zero position and engaged

☐ Filling level between min. and max.

☐ Operational light lit

Selectatec®

☐ Fastening; Latched down firmly and set vertically

☐ Handwheel; In zero position and engaged

☐ Filling level between min. and max.

☐ Interlock; Locking function OK (when present)

Checking the Condition of CO2 Absorbent

☐ Color change is no more than half the canister of CO2 absorbent.
Leak Testing the Fresh Gas Circuit

Test once without the vaporizer and once with each Dräger Vapor with the handwheel set to zero.

☐ Go to Standby and press the Leak Test soft key. Follow the instructions on the screen.

If the system leaks (i.e. pressure drops):

- Check that all plug-in, push-fit and screw connectors fit tightly.
- Replace any missing or damaged seals. If necessary, call your local Authorized Service Organization or DrägerService.

Inspiratory and Expiratory Valves (Compact Breathing Systems)

Press the ManSpont key and confirm.

Set APL-valve to MAN position and adjust to 30 cmH₂O.

Press O₂ flush.

P ☐ Breathing bag for manual ventilation fills

Inspiratory and expiratory valve discs move freely when the breathing bag is squeezed and released.

Pressure-Limiting Valve (Compact Breathing System)

P ☐ Set APL valve to MAN and 30 cmH₂O. Set fresh gas flow to 20 L/min.

P ☐ Press the ManSpont key and confirm.

When the pressure waveform on the Breathing Pressure Trace window stabilizes (e.g., a flat line), flip the APL-valve to SPONT to release pressure.

P ☐ Peak pressure display on monitor reads 24 to 36 cmH₂O.

Heated Breathing System (when present)

☐ Calibrate flow sensor.

☐ Check cable connections.

☐ Check power cord connections.

☐ Ensure that the MAINS POWER LED is illuminated.

☐ Ensure that the HEATER POWER switch is in the “ON” position.

☐ Ensure that the “HEATER POWER ON” LED is illuminated.

Ensure that the underside of the COSY is warm (approximately 35-40°C) after 30 minutes have elapsed since the “HEATER POWER ON” LED was illuminated.

Checking Ventilator Operation

P ☐ Connect a breathing bag to the Y-piece to act as test lung.

P ☐ Press the Pressure Control key and confirm.

P ☐ Check that ventilation measurements are displayed.

P ☐ Check that the ventilator piston is cycling.

P ☐ Monitor the operation of the inspiratory and expiratory valve discs.

P ☐ Check that the breathing bag (test lung) on the Y-piece is ventilating.

P ☐ Press the Standby key and confirm.
Appendix - Daily and Preuse Checkout Form

Monitors

The alarm function can be tested by setting alarm limits to levels that are certain to trigger an alarm.

Check the alarm limit settings. The monitor alarm limits are automatically set to a default configuration when the SYSTEM POWER switch is turned on. Check these settings and adjust them if necessary. Alarm limits can be adjusted at the beginning of or during a procedure. Also, make sure that any external monitors (if any) are connected properly.

Test the alarm functions for all monitors. Simulate alarm conditions and check for appropriate alarm signals.

☐ Test the O₂ monitor and alarm module.

☐ Test the volume monitor and alarm module.

☐ Test the pressure monitor and alarm module.

☐ Press the Standby key and confirm.

Additional Monitors (when present)

☐ Check the CO₂ monitor and alarm module.

☐ Check the anesthetic agent monitor and alarm module.

Anesthetic Gas Scavenging System

P ☐ Check the hose connections.

P ☐ Adjust the flow regulator to place the float between the "Minimum" and "Maximum" marks.

P ☐ Press and hold the O₂ flush button and verify that airway pressure is < 10 cmH₂O with Y-piece occluded.

P ☐ Close all flow control valves on the machine, with Y-piece occluded, and verify that airway pressure is > -0.5 cmH₂O.

Manual Ventilation Bag for Emergency Ventilation

☐ Check that the bag is functioning correctly by pumping manually.

When the bag is squeezed, air must audibly and tangibly flow out of the mask cone; when the bag is released, it must rapidly recover its original shape.

☐ Block off the mask connector (cone) with the ball of your thumb: you should only be able to squeeze the bag a little.

P ☐ Before Connecting to Patient

Verify that
• all vaporizers are off (the handwheels are set to zero),
• the APL Valve is set as desired,
• all flowmeters indicate 0,
• the patient suction is level adequate, and
• the breathing system is ready to use (the bag is in place and all hoses are connected properly)

If any check can not be carried out satisfactorily, the machine must not be used.

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These Operating Instructions apply only to

**Fabius GS**

with Serial No.:

If no Serial No. has been filled in by Draeger, these Instructions for Use are provided for general information only and are not intended for use with any specific machine or device.