Instructions for use

D-Vapor/D-Vapor 3000

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

Anesthetic agent vaporizer

Typographical conventions

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

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

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

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

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

Use of terms

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

These instructions for use apply to D-Vapor and D-Vapor 3000 anesthetic vaporizers. If information only applies to one model of anesthetic vaporizer, this is noted in the heading or in the corresponding part of the text.

Trademarks

Trademark	Trademark owner
D-Vapor®	Dräger
Selectatec®	Datex-Ohmeda
Suprane®	Baxter International Inc.
SAFE-FIL™	Baxter International Inc.

Trademark	Trademark owner
TORRANE™	Safeline Pharmaceuticals
Piramal Fill™	Piramal

Safety Information Definitions

WARNING

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

CAUTION

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

NOTE

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

Target groups

Duties of the operating organization

The tasks described in this document specify the requirements that have to be met by each respective target group.

The operating organization of this product must ensure the following:

– The target group has the required qualifications (e.g., has undergone specialist training or acquired specialist knowledge through experience).

– The target group has been trained to perform the task.

– The target group has read and understood the chapters required to perform the task.

Description of target groups

The target groups may only perform the following tasks if they meet the corresponding requirements.

Users

Task	Requirement
Use of the product in accordance with the intended use	Specialist medical knowledge in anesthesia

Service personnel

Task	Requirement
Installation	Specialist knowledge in electrical engineering and mechanics Experience in the servicing of medical devices
Basic service activities (inspection, maintenance according to the "Maintenance" section)	

Specialized service personnel

Task	Requirement
Installation	Specialist knowledge in electrical engineering and mechanics Experience in the servicing of medical devices Training in service activities on this product
Basic and complex service activities (inspection, maintenance, repair)	

Dräger recommends arranging a service contract with DrägerService.

Abbreviations and Symbols

For explanations, refer to sections "Abbreviations" and "Symbols" in the "System overview" chapter.

Contents

For your safety and that of your patients

General safety information

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

Strictly follow these instructions for use

WARNING

Risk of operating error and incorrect use

Any use of the medical device requires full understanding and strict observation of all sections of these instructions for use. This medical device may only be used for the purpose specified under "Intended use" on page 16. Strictly observe all WARNING and CAUTION statements throughout these instructions for use and all statements on medical device labels.

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

Service

WARNING

Risk of medical device failure and of patient injury

The medical device must be inspected and serviced regularly by service personnel. Repair and complex maintenance carried out on the medical device must be performed by specialized service personnel. Dräger recommends that a service contract is obtained with DrägerService and that all repairs are performed by DrägerService. Dräger recommends using original Dräger parts for servicing.

If the above is not complied with, there is a possibility of medical device failure and patient injury. Observe chapter "Service".

Safety checks

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

Accessories

WARNING

Risk due to incompatible accessories

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

Dräger recommends that the medical device is only used together with accessories listed in the current list of accessories.

Connected devices

WARNING

Risk of electric shock and of device malfunction

Any connected devices or device combinations not complying with the requirements mentioned in these Instructions for Use may compromise the correct functioning of the medical device. Before operating the medical device, strictly comply with the instructions for use of all connected devices or device combinations.

Not for use in areas of explosion hazard

WARNING

Risk of explosion and of fire

The medical device is not approved for use in areas where oxygen concentrations above 25 Vol% or combustible or explosive gas mixtures are likely to occur.

Safe connection with other electrical equipment

WARNING

Risk of patient injury

Electrical connections to equipment not listed in these instructions for use or these assembly instructions must only be made when approved by each respective manufacturer.

Patient safety

The design of the medical device, the accompanying documentation, and the labeling on the medical device are based on the assumption that the purchase and the use of the medical device are restricted to persons familiar with the most important inherent characteristics of the medical device.

Instructions and WARNING and CAUTION safety statements are therefore largely limited to the specifics of the Dräger medical device.

These instructions for use do not contain any information on the following points:

– Risks that are obvious to users
– Consequences of obvious improper use of the medical device
– Potentially negative effects on patients with different underlying diseases.

Modifications to or misuse of the medical device may be dangerous.

Patient monitoring

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

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

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

Storing the instructions for use

CAUTION

Risk of incorrect use

The instructions for use must be stored so they are accessible to the user.

Information on electromagnetic compatibility

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

Medical electrical equipment is subject to special precautionary measures concerning electromagnetic compatibility (EMC) and must be installed and put into operation in accordance with the EMC information provided on page 105.

Portable and mobile high-frequency communication equipment can affect medical electrical equipment.

WARNING

Risk of device failure

Electromagnetic fields can compromise proper operation of the device. Electromagnetic fields are generated by, e.g., radio frequency communication equipment such as:

- **Cellular phones**
- **High-frequency electrosurgical equipment**
- **Defibrillators**
- **Shortwave therapy equipment**

Use radio frequency devices only with a sufficient safety margin of at least 30 cm (11.8 in).

Product-specific safety information

WARNING

Risk of device errors

Various potentially dangerous situations can arise that require the attentiveness of users.

Only use the device under the permanent supervision of users in order to provide a prompt remedy in the event of a malfunction.

WARNING

Not permitted modifications

Modifications to the medical device that are not permitted may result in malfunctions.

This medical device must not be modified without permission from Dräger.

WARNING

Risk of patient injury

Damage to the vaporizer can cause incorrect output concentrations and serious harm to the patient.

Handle the vaporizer with care. Be careful not to tilt or drop. Do not carry by the control dial, the control dial caps or the locking lever for the plug-in adapter.

Do not use the vaporizer if it has been dropped.

Check the vaporizer that has toppled over, see "Checking operational readiness", page 54. If the check is not possible, do not use the vaporizer.

WARNING

Risk of patient injury

Incorrect concentrations of anesthetic agent can harm the patient.

Use continuous monitoring of the delivered concentrations of anesthetic agent, as per ISO 21647 or ISO 80601-2-55 standard, with upper and lower alarm limits to detect deviations in concentration.

The operability of the measuring instrument must be insured before you use it.

WARNING

Risk of patient injury

Incorrect output concentrations will not be detected when operating from the external fresh-gas outlet.

An anesthetic gas monitor must be used if the vaporizer is used with anesthesia machine via the external fresh-gas outlet.

WARNING

Risk of patient injury

Device function can be interfered with.

Do not use the vaporizer with magnetic resonance imaging (MRI).

WARNING

Risk of patient injury

Deviation of the delivered concentration due to filling the vaporizer with incorrect anesthetic agent.

Only fill the vaporizer with desflurane.

WARNING

Risk of patient injury

Risk of incorrect output concentration and impeded breathing due to high breathing resistance

The vaporizer is not suitable for use in a breathing system.

WARNING

Risk of patient injury

High desflurane settings reduce the O_2 concentration in fresh gas.
High desflurane concentrations can affect hot wire volume measurement! The indicated volume is too high.
High-frequency ventilation or the use of anesthesia machines with discontinuous fresh-gas flow or repeated use of the O_2 flush can cause the vaporizer to switch off.

Observe the instructions for use for the anesthesia machine.

WARNING

Risk of patient injury

Device functions can be manipulated or switched off via the RS232 interface.

The available RS232 interface must only be used for service purposes.

WARNING

Risk of the device catching fire

The vaporizer may ignite as a result of a fire on the patient side.

In the event of a fire, disconnect the oxygen-carrying connections from the vaporizer.

CAUTION

Health hazard

Take care not to spill anesthetic agent.

Do not inhale anesthetic agent vapors.

CAUTION

Risk of patient injury

Observe the instructions for use provided by the manufacturer of the anesthetic agent. Pay particular attention to the described indications, contraindications, side-effects, MAC values, and expiration date of the anesthetic agent used.

Essential performance

The essential performance of D-Vapor and D-Vapor 3000 anesthetic vaporizers consists in the enrichment of medical fresh gases with desflurane vapor and the generation of alarms in the event of overpressure or underpressure in the internal desflurane vapor supply with an accuracy which can be found in the technical data.

Additional safety information for D-Vapor 3000

WARNING

Risk of patient injury

The transfer of data to the anesthesia workstation can be erroneous.

The indication of the control dial position on the screen of an anesthesia workstation with the Vapor View option is provided only for information.
Only rely on the concentration that is set on the vaporizer.

WARNING

Risk of patient injury

The transfer of data to the anesthesia workstation can be erroneous.

The indication of the filling level on the screen of an anesthesia workstation with the Vapor View option is provided only for information.
Only rely on the filling level shown on the vaporizer.

WARNING

Risk of patient injury

The transfer of data to the anesthesia workstation can be erroneous.

The indication of the detected, active vaporizer type on the screen of an anesthesia workstation with the Vapor View option is provided only for information.
Only rely on the anesthetic agent (color coding, labeling) shown on the vaporizer.

This page has been left blank intentionally.

Use

Intended use

The D-Vapor/D-Vapor 3000 is a heated, calibrated anesthetic vaporizer for enriching dry, medical fresh gas of anesthesia workstations with vapor of the anesthetic agent desflurane for the range of concentrations from 2 to 18 Vol%.

Environment of use

D-Vapor/D-Vapor 3000 is intended for operation with anesthesia workstations in hospitals and rooms used for medical purposes.

Restrictions to the working area

D-Vapor/D-Vapor 3000 is not suitable for operation in rooms used for magnetic resonance imaging.

Installation and/or operation with anesthesia workstations in moving vehicles, airplanes, helicopters or ships is not permitted.
If there is a need for such an application, operation is only permitted with the approval of the manufacturer.

System overview

Comparison D-Vapor with D-Vapor 3000

	D-Vapor	D-Vapor 3000
Anesthetic agent	Desflurane (DES)	Desflurane (DES)
Connection and Interlock system	Plug-in adapter DW-2000 with Interlock 2 Dräger Auto Exclusion plug-in adapter Plug-in adapter S-2000 with Interlock S Permanent connection ISO conical adapter	Dräger Auto Exclusion plug-in adapter
Filling system	Baxter SAFE-FIL filling system for desflurane (Suprane) Piramal Fill filling system for desflurane (Torrane)[1)]	Baxter SAFE-FIL filling system for desflurane (Suprane) Piramal Fill filling system for desflurane (Torrane)[1)]

1) The filling system is not available in every country.

What is new with the D-Vapor 3000 design

– Ergonomically designed locking bar

– Ergonomically designed control dial

What is new with the D-Vapor 3000 functionality

D-Vapor 3000 has Vapor View functions.

Vapor View functions are only active in conjunction with Dräger anesthesia workstations that have the Vapor View option.

Vapor View functions:

– The control dial is illuminated.

– The sight glass is illuminated.

– The position of the control dial is transferred to the anesthesia workstation as a setting value.

– When the refill mark is reached, a filling level message is displayed on the anesthesia workstation screen.

– The recognized active vaporizer type is displayed on the anesthesia workstation screen.

Vapor View functions are only available for the D-Vapor 3000 anesthetic vaporizer and cannot be fitted to the D-Vapor anesthetic vaporizer.

Overview of functions

Each vaporizer is calibrated for the anesthetic agent specified on the device and is only suitable for that anesthetic agent.

The delivered concentration is, for the most part, not influenced by operating and ambient conditions, such as temperature, gas flow and ventilation pressure. See chapter "Description", page 109 to page 111.

The vaporizer is inserted in the fresh-gas line of the anesthesia workstation which typically delivers a continuous fresh-gas flow. The vaporizer is connected between the fresh-gas metering unit and the fresh-gas outlet.

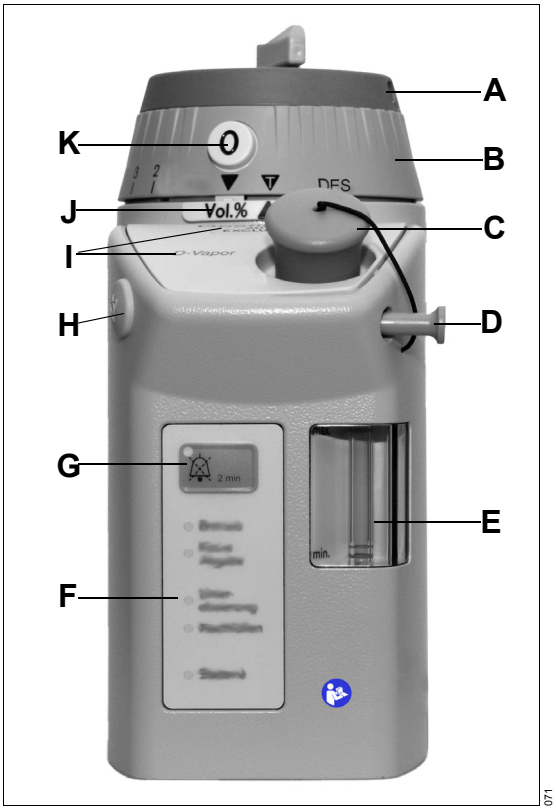
Functional integrity of the vaporizer is dependent on the direction of flow. The vaporizer must be connected and operated in accordance with the direction of flow specified on the device. The use of the vaporizer with different anesthesia workstations is therefore only permissible and safe when it is used with the appropriate special adapter. Simultaneous operation of several vaporizers connected in series is not permissible, particularly for different anesthetic agents.

The vaporizer is not suitable for use in a breathing system due to high pneumatic resistance.

D-Vapor/D-Vapor 3000 may only be used with anesthesia machines which conform to one of the following standards:
– IEC 60601-2-13
– ISO 80601-2-13
– ASTM F 1850

D-Vapor

Front



A Control dial cap with color coding of the anesthetic agent and with Interlock coding

B Control dial with concentration markings

C Sealing plug

D Unlocking button for the sealing plug

E Sight glass for displaying the filling level

F Display panel

G Button for suppressing the acoustic alarm for 2 minutes

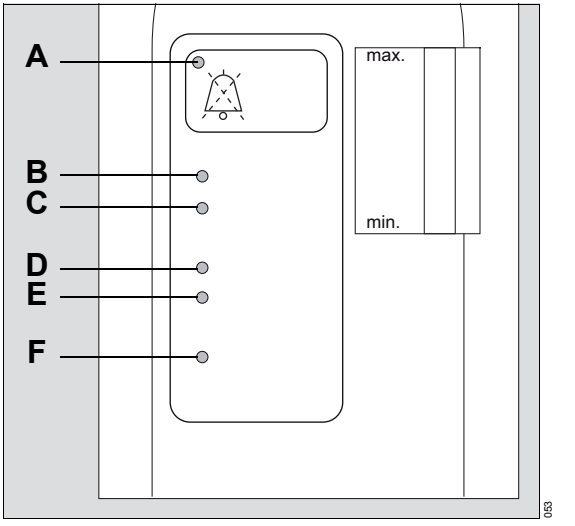
H Protective cap for equipotential equalization pin

I Indication of anesthetic agent and vaporizer model

J Indication of concentration units

K ***0*** button for locking the control dial in the ***0*** or ***T*** position

Display panel



A Yellow LED ***Audio paused 2 min***

B Green LED ***Operational***

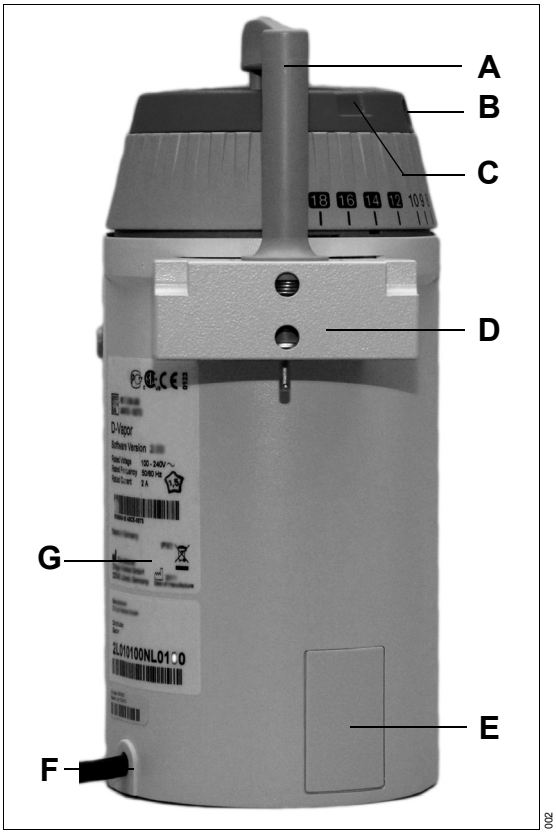
C Red LED ***No Output***

D Red LED ***Delivery Low***

E Yellow LED ***Fill Up***

F Yellow LED ***Battery***

Rear



A Locking lever of plug-in adapter

B Opening for Interlock locking device (illustration showing: Interlock 2)

C Slot for locking lever, so that the vaporizer can only be removed from the anesthesia workstation when the control dial is in the ***T*** position

D Connection system
(Shown: Plug-in adapter DW-2000)

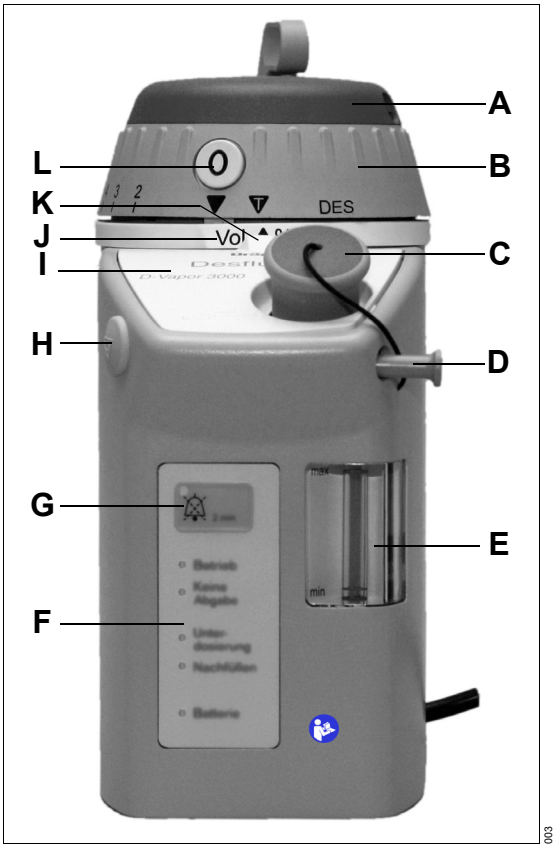
E Cover for RS232 interface

F Power cable

G Rating plate indicating manufacturer, model, and serial number

D-Vapor 3000

Front



A Control dial cap with color coding of the anesthetic agent and with Interlock coding

B Control dial with concentration markings

C Sealing plug

D Unlocking button for the sealing plug

E Sight glass for displaying the filling level

F Display panel

G Button for suppressing the acoustic alarm for 2 minutes

H Protective cap for equipotential equalization pin

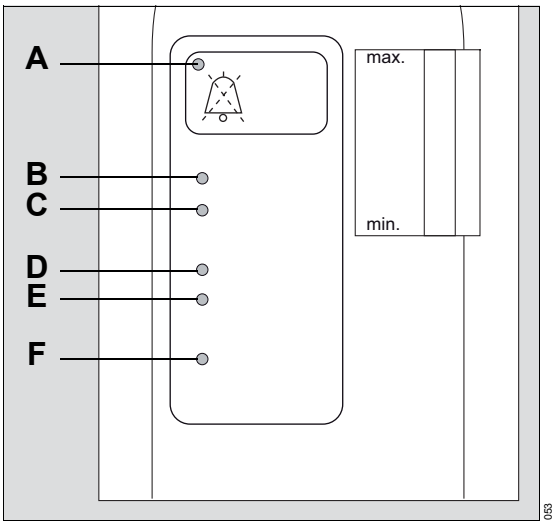
I Indication of anesthetic agent and vaporizer model

J Indication of concentration units

K Window to allow light to exit for illumination

L ***0*** button for locking the control dial in the ***0*** or ***T*** position

Display panel



A Yellow LED ***Audio paused 2 min***

B Green LED ***Operational***

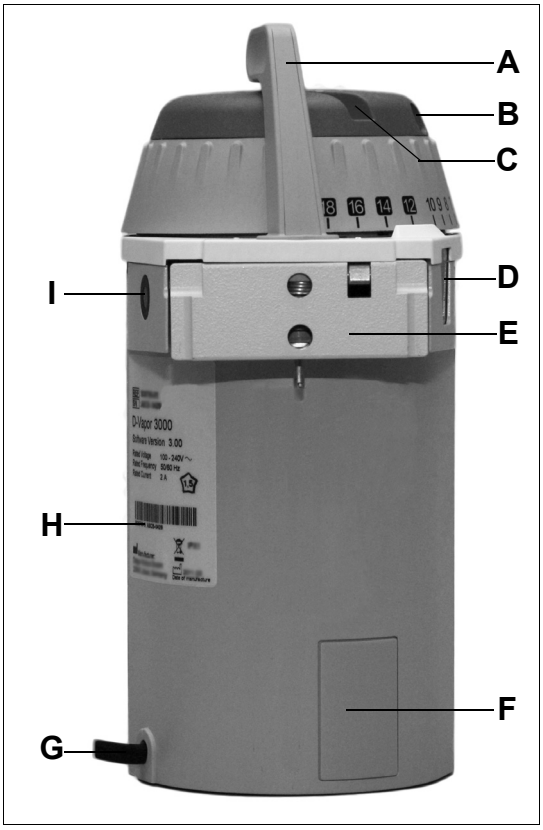
C Red LED ***No Output***

D Red LED ***Delivery Low***

E Yellow LED ***Fill Up***

F Yellow LED ***Battery***

Rear



A Locking lever of plug-in adapter

B Opening for Interlock locking device (illustration showing: Interlock 2)

C Slot for locking lever, so that the vaporizer can only be removed from the anesthesia workstation when the control dial is in the ***T*** position

D Window for reading Vapor View data

E Connection system
for the Auto Exclusion plug-in adapter
D-Vapor 3000
is only available with this plug-in adapter

F Cover for RS232 interface

G Power cable

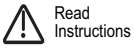
H Rating plate indicating manufacturer, model, and serial number

I Window to allow light to enter in order to illuminate the control dial and the sight glass

Abbreviations

Abbreviation	Description
°C	Degree Celsius, unit of temperature
°F	Degree Fahrenheit, unit of temperature
®	Registered trademark
Air	Medical compressed air
ASTM	American Society for Testing and Materials
cmH_2O	Unit of pressure (1 cmH_2O = ca.1 mbar)
CO_2	Medical carbon dioxide
CSA	Canadian Standards Association
DC	Direct current
EN	European standard
ft	Foot, unit of length
hPa	Hectopascal (1 mbar = 100 Pa or 1 hPa), unit of pressure
IEC	International Electrotechnical Commission, organization for international standards
in	Inch, unit of length
ISO	International Organization for Standardization
kg	Kilogram, unit of mass
kPa	Kilopascal, unit of pressure
lbs	Pound, unit of mass
m	Meter, unit of length
MAC	Minimum Alveolar Concentration
mL	Milliliter, unit of volume
mm	Millimeter, unit of length
MRI	Magnetic resonance imaging
MV	Minute volume
N_2O	Medical nitrous oxide
NMD	Narkomed (name for anesthesia machine from Draeger, Inc., USA, formerly North American Dräger)
O_2	Medical oxygen
Pa	Pascal (1 mbar = 100 Pa or 1 hPa), unit of pressure
P_{EIRP}	Equivalent isotropic transmission power of the adjacent radio equipment
psi	Pound force per square inch, unit of pressure
rel. %.	Relative deviation from value in %
STPD	Standard temperature and pressure, dry 20 °C (68 °F), 1013 hPa, dry gas
™	Trademark
VAH	Verbund für Angewandte Hygiene e.V. (Association for Applied Hygiene)
Vol	Volume
Vol%	Volume percent of anesthetic agent in fresh gas at vaporizer outlet. Unit of dosing
V_T	Tidal volume

Symbols

Symbol	Description
	Follow the instructions for use
	Caution! Observe accompanying documents
	Caution! Observe accompanying documents
	Warning! Strictly follow these instructions for use.
	Connection for potential equalization
2; ***3***; ***4***;...	Concentration scale on the control dial of the Vaporizer for values up to and including 10 Vol%.
12 14 16 18	Concentration numbers on the vapor control dial indicating the dangers of a high output concentration and a restricted flow range
	On rear of the vaporizer and on the connector, indicates direction of flow of the vaporizer
0	On the pushbutton for locking the control dial. Control dial position ***0*** (zero setting), see page 30
	Control dial position ***T*** (transport setting), see page 30
D, ***DES*** (D-Vapor)	On control dial
Des., ***DES*** (D-Vapor 3000)	Abbreviation of the anesthetic agent for which the vaporizer is specified and calibrated
min.	Minimum permissible filling level on the sight glass
max.	Maximum permissible filling level on the sight glass

Symbol	Description
Vol%	Volume percent, indicates concentration unit
Vol	Volume
 ***Audio paused 2 min***	Suppress audible alarm for 2 minutes
	Information for disposal
	Fuse
	Alternating current
	Part number
	Serial Number
	Manufacturer
 20xx	Date of manufacture
IPX1	Level of protection from ingress of water
	Maximum weight of the vaporizer
	Use by
	Temperature limitation
	Relative humidity
	Atmospheric pressure
	Keep dry
	Caution, fragile
	Device is not approved for use in MR environments

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Operating concept

Operating states

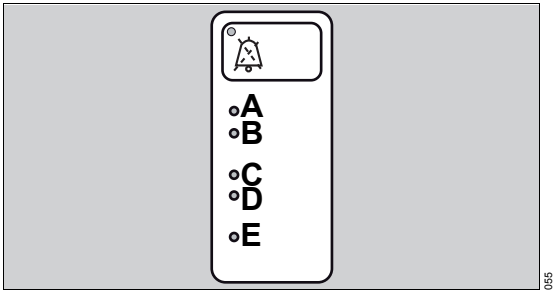
The operating states for the D-Vapor and D-Vapor 3000 are identical.

When in use, the vaporizer can take the following operating states, which are indicated by LEDs in the display panel:
– Vaporizer off
– Self-test
– Vaporizer warming up
– Vaporizer ready for operation
– Vaporizer dosing

Alarm cases are described in the chapter "Alarm cases" on page 78.

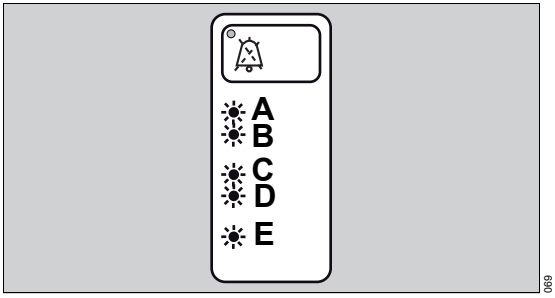
Vaporizer off

The vaporizer power cable is not connected to the power supply. All LEDs (A), (B), (C), (D), (E) are off.



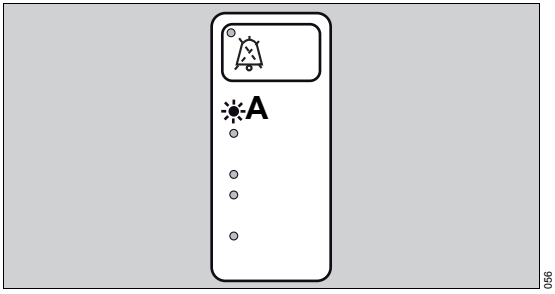
Self-test

The power cable is connected to the power supply. All LEDs (A), (B), (C), (D) and (E) light. A short tone sounds at the start and end of the self-test.



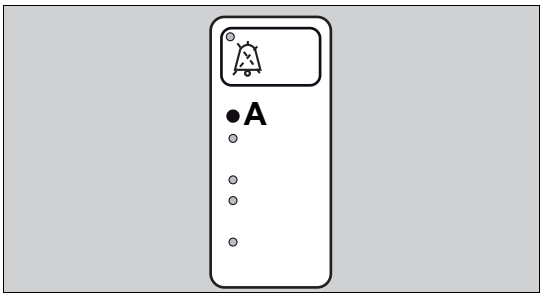
Vaporizer warming up

The power cable is connected to the power supply. The vaporizer is warming up. The operating temperature has not yet been reached. The green ***Operational*** LED (A) is flashing. A short tone sounds at the end of the warm-up procedure.



Vaporizer ready for operation

The Vaporizer is at the operating temperature. The control dial is at the ***0*** or the ***T*** position. The ***Operational*** LED (A) is lit.



Vaporizer dosing

The vaporizer is ready for use. The control dial is at a position ≥2 Vol%. The ***Operational*** LED is lit.

Control dial

The operation of the control dial is identical for D-Vapor and D-Vapor 3000.

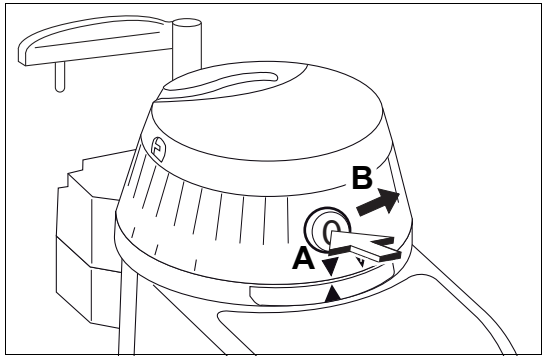
The concentration of the anesthetic agent is set with the control dial. In the ***0*** position (zero setting) and the ***T*** position (transport setting), the control dial is locked and can only be adjusted by keeping the ***0*** button pressed.

All illustrations of a vaporizer on an anesthesia workstation show a stylized anesthesia workstation in the background.

All illustrations of the ***T*** position (transport setting) only show the disconnected vaporizer itself.

Control dial position *ON* – switching on and adjusting the concentration

Only adjust the concentration when the vaporizer is connected to an anesthesia workstation.



1 Press the ***0*** button (A).

2 Turn the control dial (B) counterclockwise to the required concentration of anesthetic agent.

If the vaporizer is not ready for use, an audible alarm will sound, see chapter "Alarm cases" on page 78.

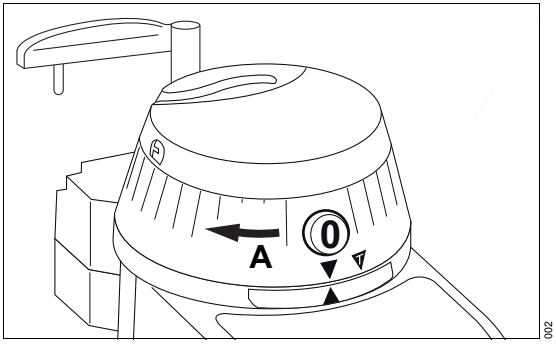
NOTE

Concentration values greater than 12 Vol% are shown in inverted form in order to draw attention to the danger of a high output concentration and restricted flow range.

The concentration range above 12 Vol% can only be reached by pressing the ***0*** key a second time.

Control dial position *0* – switching off

Always set the control dial to the ***0*** position when the vaporizer is connected to an anesthesia workstation but no anesthetic agent is to be administered.



1 Turn the control dial (A) clockwise to the ***0*** position – the ***0*** button engages.

WARNING

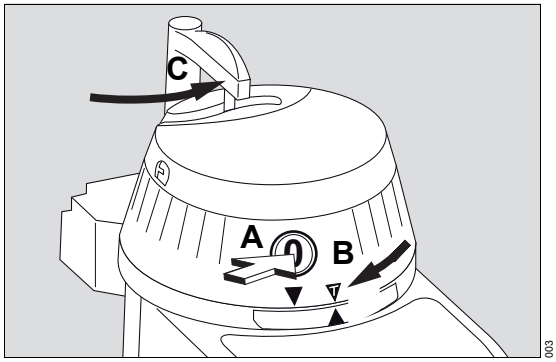
Danger to the patient and the user.

Delivery of incorrect concentration or escape of anesthetic agent from the vaporizer.

If the control dial is set to *0* or above *0*, do not use the vaporizer at an angle of more than 10°.

Control dial position *T* – transport setting

Always set the control dial to the ***T*** position when the vaporizer is being disconnected from the anesthesia workstation or is connected to the parking holder.



1 Press the ***0*** button (A).

2 Turn the control dial (B) clockwise to the ***T*** position – the ***0*** key engages.

3 Engage the locking lever (C) on the plug-in adapter in the control dial.

Connection and Interlock systems for D-Vapor

Different connection systems are available for operating the D-Vapor anesthetic vaporizer with anesthesia workstations.

When anesthesia workstations have several vaporizer connectors, the different Interlock systems* ensure that only one vaporizer can be used at any one time, and the others are switched off and blocked.

The Interlock system on the vaporizer and anesthesia workstation must be functional.

WARNING

Risk of patient injury

More than one vaporizer can be switched on if there is a malfunction in the Interlock system. This may endanger the patient by causing overdosing or a mixture of anesthetic agents.

The tabs in the two openings in the control dial cap on the Interlock 2 must be undamaged. See also the chapter "Checking operational readiness" on page 54 for more information.

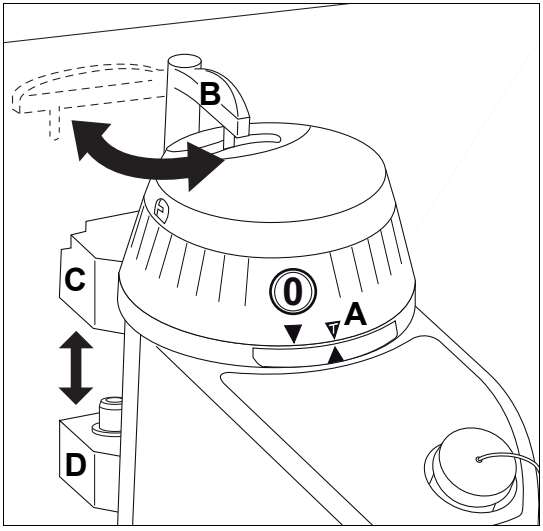
Plug-in adapter/plug-in connector

The plug-in adapter and the plug-in connector are used to provide a secure connection and quick and convenient changing of the vaporizer.

Plug-in adapter:	part of the connection system that connects to the vaporizer
Plug-in connector:	part of the connection system that connects to the anesthesia machine

Most plug-in connectors have valves through which fresh gas can flow even if the vaporizer is not connected. These plug-in connectors can be identified by the movable valve inserts in the inner holes on the connector pins.

Some older vaporizers with plug-in adapters carry an anesthetic agent code on the rear, which can be read and displayed by anesthesia workstations designed for this purpose (Dräger anesthesia machines Cato and Cicero).



1 When connecting or disconnecting the vaporizer, the control dial must be at the ***T*** position (A) and the locking lever (B) must be engaged in the control dial.

2 The holes in the plug-in adapter (C) on the vaporizer fit onto the pins on the plug-in connector (D) on the anesthesia workstation.

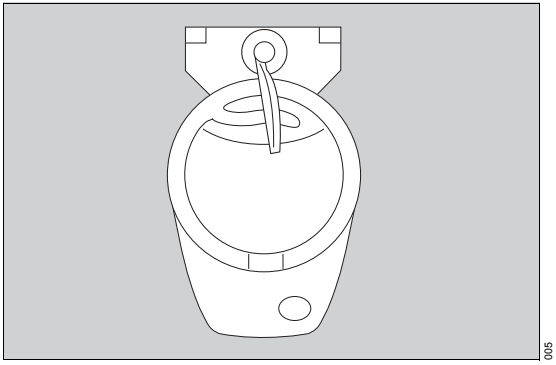
3 To secure or release, swing the locking lever (B) into position and engage or disengage the pin in the control dial cap of the vaporizer.

The locking lever (B) and pin help to ensure that the vaporizer is handled correctly and that it can only be fitted and disconnected when the control dial is at the ***T*** position (A).

* The different Interlock systems cannot be combined. The vaporizer can be converted from one system to another by specialized service personnel.

Plug-in adapter DW-2000 with Interlock 2

The DW-2000 plug-in adapter is connected to Dräger plug-in connectors.



NOTE

The DW-2000 plug-in adapter is not compatible with the Dräger Auto Exclusion plug-in connector.

For anesthesia workstations with two plug-in connectors combined with Interlock 2

The locking bar, which can only be engaged in the control dial when in ***0*** position, only allows one vaporizer to be used at any one time.

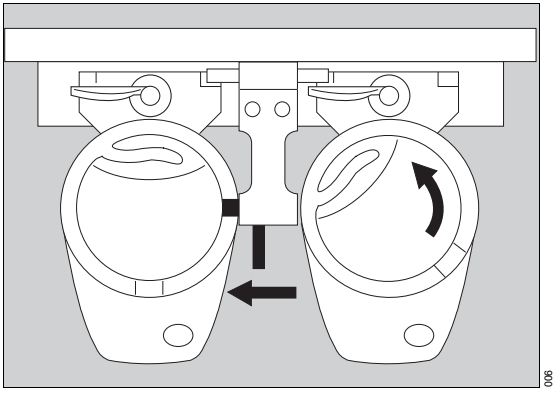


Illustration: left vaporizer blocked, right vaporizer operational.

Dräger Auto Exclusion plug-in adapter

The Dräger Auto Exclusion plug-in adapter is connected to Dräger Auto Exclusion plug-in connectors or to Dräger plug-in connectors.

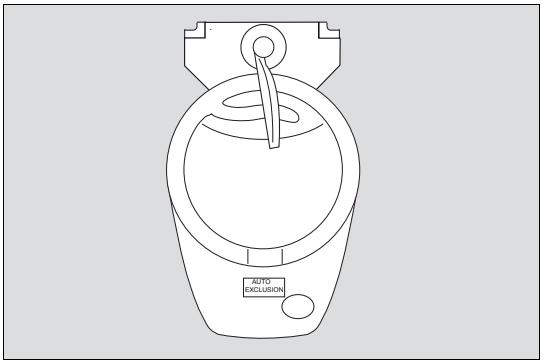
NOTE

The Dräger Auto Exclusion plug-in adapter is compatible with the DW-2000 plug-in connector.

Anesthesia workstations with Auto Exclusion plug-in connectors

Auto Exclusion plug-in connectors are designed only for vaporizers with Auto Exclusion plug-in adapters and are marked with the following symbol on the anesthesia workstation.

- Only plug vaporizers with Auto Exclusion plug-in adapters into Auto Exclusion plug-in connectors.



When a vaporizer is switched on, a pin on the underside of the plug-in adapter is pushed out. Via an internal mechanism, this pin prevents other vaporizers on adjacent connectors from being switched on.

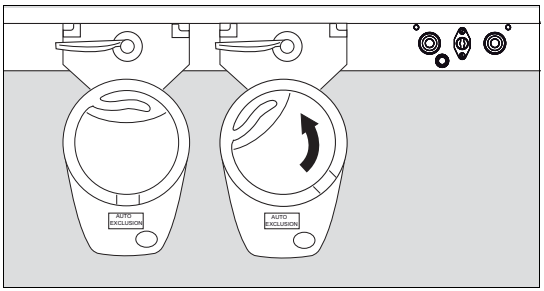
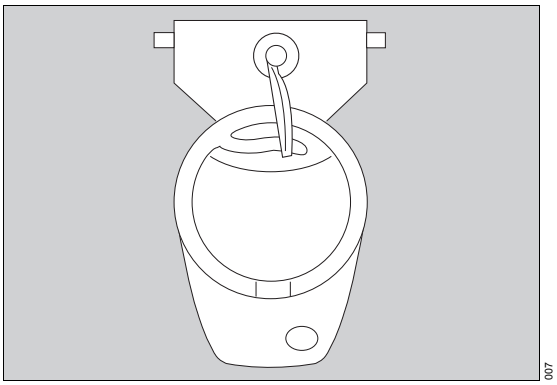


Illustration: left vaporizer blocked, right vaporizer operational.

Plug-in adapter S-2000 with Interlock S

The S-2000 plug-in adapter with Interlock S is connected to Selectatec-compatible plug-in connectors.



For anesthesia workstations with several plug-in connectors combined with Interlock S

When a vaporizer is switched on, two pins on the side of the relevant plug-in adapter are pushed out. These pins prevent other vaporizers on adjacent plug-in connectors from being switched on.

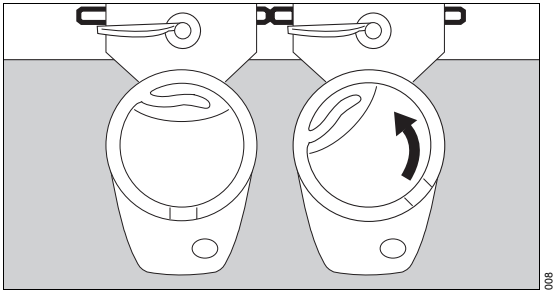


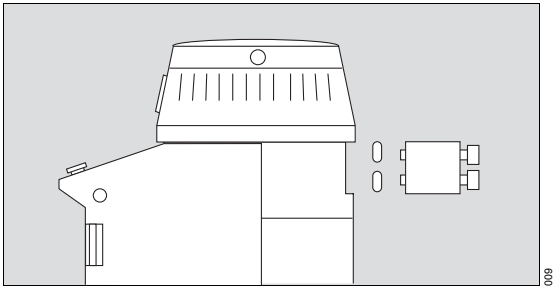
Illustration: left vaporizer blocked, right vaporizer operational.

WARNING

When operating an anesthesia workstation with three vaporizers and Interlock S, Interlock S may cease to function effectively when the middle vaporizer is disconnected.

Permanent connection

For permanent installation in the fresh-gas line for anesthesia workstations, with the appropriate connector options.



For anesthesia workstations with several connectors combined with Interlock NMD.

When a vaporizer is switched on, the levers are activated. These levers prevent other vaporizers on adjacent plug-in connectors from being switched on.

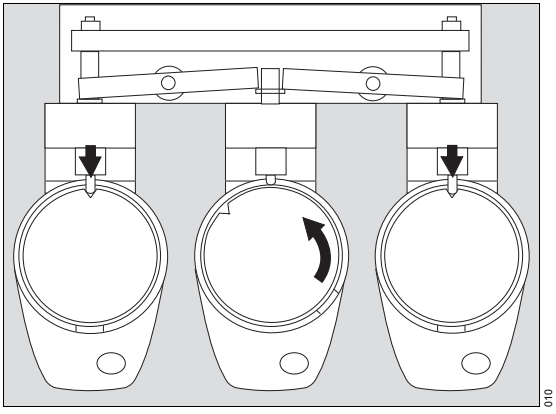
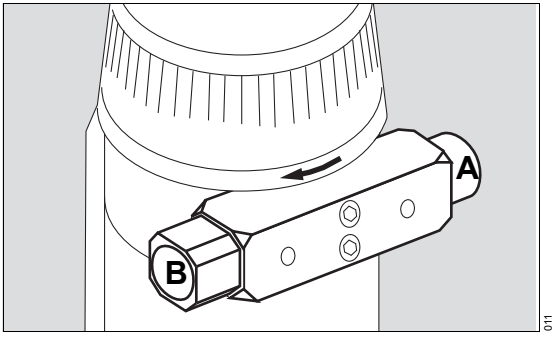


Illustration: central vaporizer operational, right and left vaporizers blocked.

Other Interlock systems are also used, such as Interlock 1, which are very similar to Interlock NMD but which do not need to fit vaporizers with Interlock NMD.

ISO conical adapter

The ISO conical adapter is used for anesthesia workstations with 23 mm (0.91 in) conical connectors conforming to ISO 5356-1.



A Male adapter cone on the vaporizer inlet

B Female adapter cone on the vaporizer outlet

Connection and Interlock systems for D-Vapor 3000

D-Vapor 3000 is only available with the Dräger Auto Exclusion plug-in adapter, see "Dräger Auto Exclusion plug-in adapter" on page 32.

Filling systems

The filling systems are used for filling with the desflurane anesthetic agent.

Filling systems consist of the specific filling device on the vaporizer and the corresponding anesthetic agent bottle.

The following filling systems are available:
– Baxter SAFE-FIL filling system for desflurane (Suprane)
– Piramal Fill filling system for desflurane (Torrane)

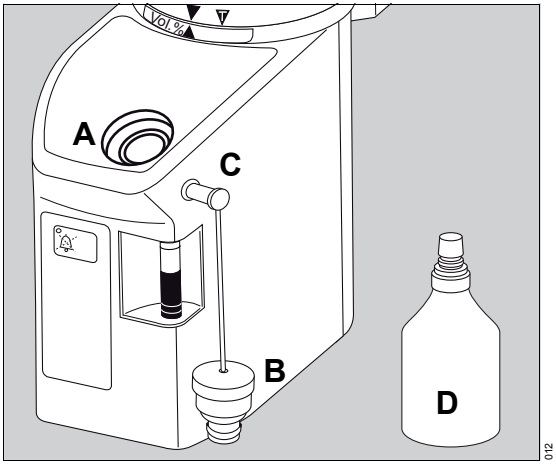
Vaporizers are labeled for a particular filling system.

NOTE

Only use desflurane bottles that are intended for the relevant filling system.

Note the label of the filling opening of the anesthetic vaporizer.

Baxter SAFE-FIL filling system for desflurane (Suprane)



The Baxter SAFE-FIL filling system consists of the following components:

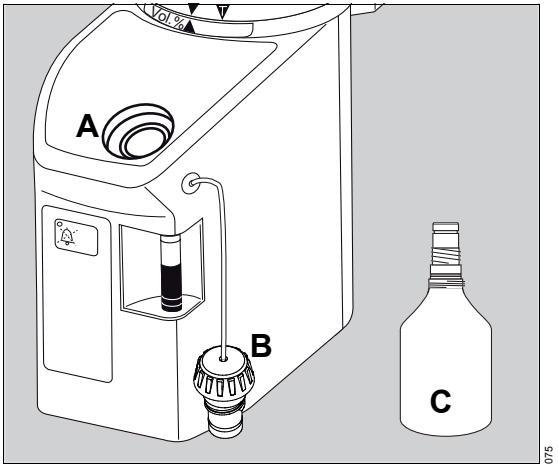
A Filling opening

B Sealing plug

C Unlocking button

D Anesthetic agent bottle with filling adapter for desflurane (Suprane)

Piramal Fill filling system for desflurane (Torrane)



The Piramal Fill filling system for desflurane (Torrane) consists of the following components:

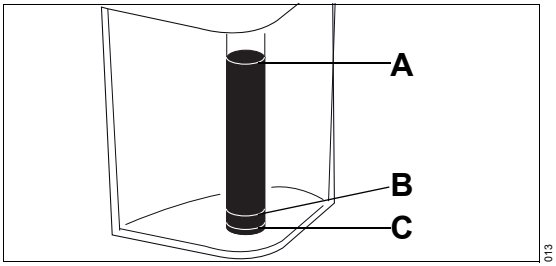
A Filling port with the ***Desflurane Piramal Fill*** label

B Screw cap

C Anesthetic agent bottle with filling adapter for the Piramal Fill filling system for desflurane (Torrane)

Sight glass

The filling system includes a sight glass with markings. The sight glass shows the filling level.



A Maximum mark: The vaporizer is filled to the maximum; further filling is not possible.

B Refill mark: Up to 240 mL of desflurane can be refilled using an anesthetic agent bottle.

C Minimum mark: Minimum filling level; there is still a reserve of approx. 40 mL in the tank. At the very latest, the vaporizer should be filled when the minimum mark is reached.

Bubble formation in the sight glass

When withdrawing desflurane at a high rate (high concentration set and/or high fresh-gas flow), vapor bubbles can appear in the sight glass. This has no effect on the functioning of the vaporizer. If the concentration and or the fresh-gas flow is set lower, the bubbles will disappear immediately.

Position of the user

The position of the user in normal operation is determined by visual contact with the sight glass for displaying the filling level and by operating the control dial.

Preparation

Before first use

Perform the following steps before using a vaporizer for the first time:
– Check that the vaporizer, the power cable, and the battery are not damaged.
– Have the battery fitted by maintenance personnel
– Have the power cable connected by maintenance personnel

Fitting the battery

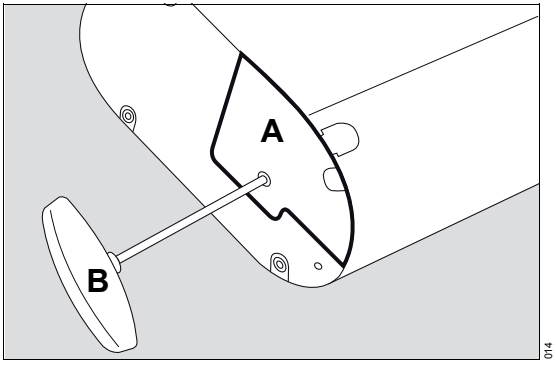
WARNING

Risk of patient injury

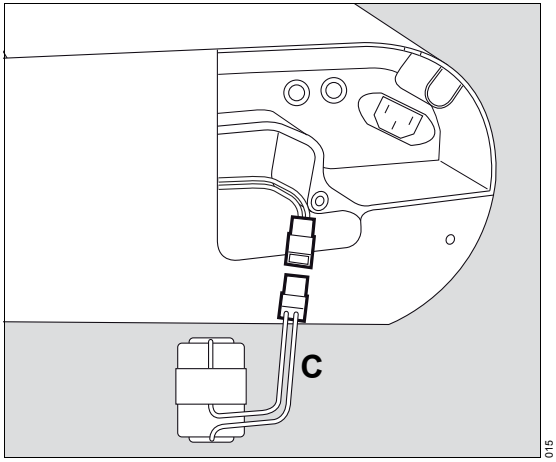
If the battery is not present or is damaged, the secondary alarm system will not be available. Furthermore, emergency operation may be partially or completely unavailable.

Only operate the vaporizer with a functioning battery.

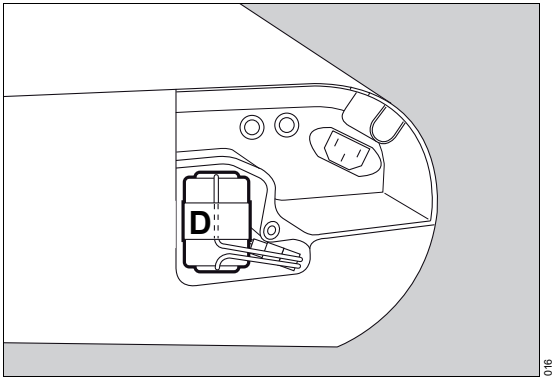
1 Unscrew the baseplate (A) using a 2.5 mm (0.1 in) screwdriver (B).



2 Connect the battery cable (C).

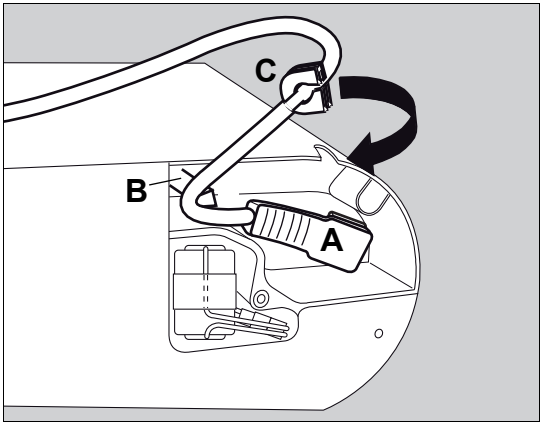


3 Insert the battery (D) in the battery compartment.



Connecting the power cable

Only use the correct power cable.



1 Lay the vaporizer on its side.

2 Plug the IEC connector (A) into the socket.

3 Lay the cable in a loop around the strain relief post (B).

4 Insert the cable bushing (C) with the cable into the casing.

5 Refit the baseplate.

Before first operation and after disconnection from mains power supply for an extended time

1 Connect the vaporizer to mains power supply for 1 hour. The battery will be charged.

2 Set control dial to the ***T*** position.

3 Fill the vaporizer, see page 42.

4 Check operational readiness, see page 54.

5 Check the concentration, see page 57.

Fitting the connectors

WARNING

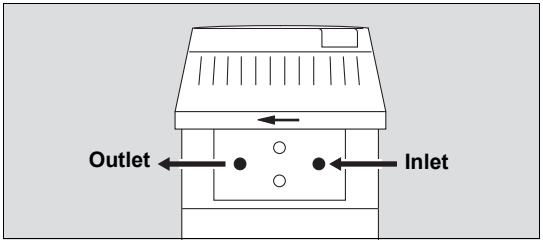
Risk of incorrect output concentration or escape of anesthetic agent

Connectors may only be fitted by specialized service personnel as the connectors must be dismantled and checked.

Use only authentic Dräger parts. Otherwise, the correct functioning of the medical device may be compromised.

Only selected materials may be used with anesthetic agents.

- Always connect the vaporizer in such a way that the gas flows as shown in the diagram and matches the arrow on the rear of the vaporizer.



WARNING

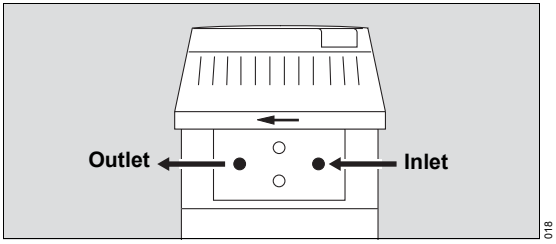
Risk of patient injury

If the flow is in the wrong direction, an incorrect concentration may be delivered, often an increased concentration.

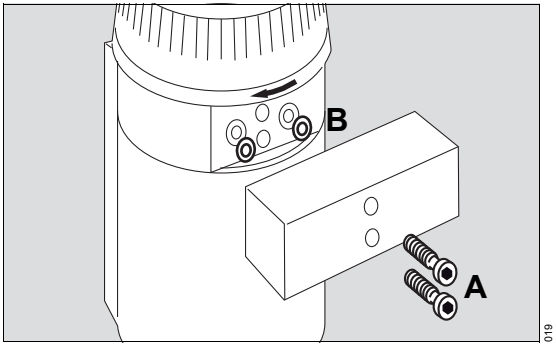
- Observe instructions for use of the anesthesia workstation.

- For ISO conical adapters: the male cone of the adapter is the vaporizer inlet; the female cone of the adapter is the vaporizer outlet.

Fitting the plug-in adapter or the ISO conical adapter (D-Vapor only)



1 Remove protecting cap on gas inlet/gas outlet at the back, if fitted.



2 Use two new screws (A); do not re-use old screws:

- Strength class 10.9, surface A2R conforming to DIN ISO 4042, heat treated
- Dimensions DIN EN ISO 4762-M4 x length depending on connector. Screws fitted through the connector must be screwed into place with a thread length of no less than 5 mm (0.2 in) and no more than 7 mm (0.27 in). If screws less than 25 mm (1 in) long are used, additional centering pins must be fitted between the plug-in adapter and the vaporizer.
- Do not use fan locking washers, plain washers or similar.

3 Before fastening, check that the sealing surfaces are clean and undamaged.

4 Place the sealing rings (B), part no. M 21929, on the sealing areas around the gas passages.

5 Tighten screws to a torque of 270 to 300 Ncm once; do not tighten any more.

6 Check that the connector is secure.

WARNING

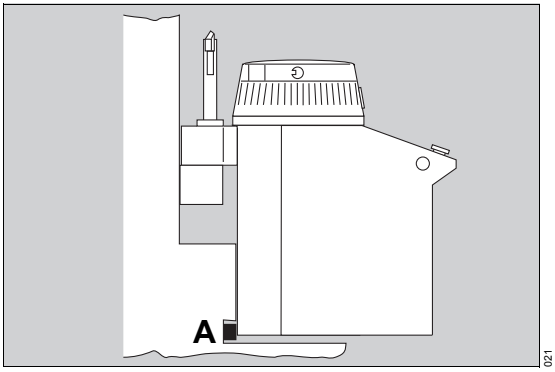
Risk of injury. Risk of incorrect output concentration

If these requirements are not met, the vaporizer might loosen and fall off.

Connecting to a Titus anesthesia workstation (D-Vapor only)

Before the connection is made, the workstation must be converted for operation with the D-Vapor (only by specialized service personnel).

D-Vapor 3000 is not suitable for use with Titus anesthesia workstations.



Detail of conversion:
Rubber buffer (O_2 warning) fitted at the point where vaporizer is suspended (A), fits flush with surface of housing.

Checking the plug-in adapter

- Check that the vaporizer fits flush with the lower installation points and, when viewed from the side, is suspended from the machine in a vertical position.

WARNING

Risk of patient injury

Risk of fresh gas and anesthetic vapor escaping.

If the vaporizers are not correctly positioned, loss of fresh gas, leaks, or low concentrations of anesthetic agent may result.

The plug-in adapter must sit evenly and horizontally on the seals.

WARNING

Risk of a malfunction

The following plug-in adapters are designed solely for connection to Dräger plug-in connectors.

- **D-Vapor with plug-in adapter DW-2000 and plug-in adapter Auto Exclusion**
- **D-Vapor 3000 with plug-in adapter Auto Exclusion**

- The vaporizer may only be used on anesthesia workstations from other manufacturers after the operating organization has checked the required interfaces for compliance with geometry, pressure, and flow (on each type of anesthesia workstation).

WARNING

Delivery of incorrect concentrations

Any incompatibility with anesthesia systems from other manufacturers may result in malfunctions.

If the vaporizer is connected to anesthesia systems from other manufacturers, it is the responsibility of the operator to ensure that all technical specifications of the vaporizer and the anesthesia system are met.

Filling the Vaporizer

Safety information concerning filling the vaporizer

WARNING

Risk of patient injury

The concentration of anesthetic agent delivered could be significantly higher or lower than the concentration set on the control dial.

Only use desflurane*) to fill the vaporizer models D-Vapor and D-Vapor 3000.

Do not use a vaporizer which has been filled or partly filled with the wrong anesthetic agent or other substances.

Contact specialized service personnel.

*) Only use anesthetic agents that are permitted in the country of use.

CAUTION

Health hazard

Take care not to spill anesthetic agent.

Do not inhale anesthetic agent vapors.

Observe the manufacturer's regulations regarding the correct use and storage of the anesthetic agent, particularly the regulations concerning the correct temperature range.

WARNING

Observe the safety data sheet from the anesthetic agent manufacturer. Adhere to the specified protective measures.

Observe the use-by date for the anesthetic agent. When using products with different trade names, make sure that the correct agent is used, for example, by following the color code of the vaporizer and the anesthetic agent bottle:

Desflurane	blue

WARNING

Risk of explosion when used with flammable substances

The vaporizer is not approved or certified for use with flammable or explosive anesthetic agents (e.g., ether or cyclopropane).

WARNING

Risk of patient injury

Some anesthetic agents monitors cannot identify mixtures of anesthetic agents and/or detect that the anesthetic agent being measured differs from the agent that was set. Unusual deviations in the concentration displayed on the monitoring system may indicate incorrect filling.

In this case, do not continue to use the vaporizer. Mark the vaporizer with a note about incorrect filling and have it repaired by specialized service personnel.

WARNING

Health hazard

Danger of overfilling and resultant desflurane vapors or spurting anesthetic agent.

Make sure the vaporizer is standing upright or hanging vertically while it is being filled.

WARNING

Health hazard

Only fill the D-Vapor/D-Vapor 3000 in adequately ventilated surroundings. Do not inhale the anesthetic agent vapors.

WARNING

Risk of patient injury

Filling during battery operation shortens the battery operating time.

Never fill the vaporizer models D-Vapor and D-Vapor 3000 during battery operation.

WARNING

Risk of patient injury

Watch the filling level in the sight glass.

Fill the vaporizer to the maximum mark only.

When the filling level is below the minimum mark, the vaporizer must be refilled.

CAUTION

Health hazard

Anesthetic agent may spurt if the filling device is contaminated by dirt particles.

Keep the filling device clean. Dirt particles must not get into the filling device.

NOTE

Before initial use or after long periods of storage, warm up the Vaporizer until the green ***Operational*** LED is permanently lit. Then fill the vaporizer to the maximum mark.

NOTE

The filling level in the sight glass will only be shown correctly if the vaporizer is standing or hanging vertically.

NOTE

Vaporizers that are supplied by a pharmaceutical company and identified accordingly are intended for use only with the anesthetic agent from that company. Only use the filling adapter provided for that particular filling system.

When the filling level has reached the refill mark, up to 240 mL of the desflurane may be refilled using an anesthetic agent bottle. This is indicated by the yellow ***Fill Up*** LED lighting. A short tone sounds.

Vaporizer states for filling

The vaporizer can be filled in the following states:

– when switched off (power cable not in the power socket)

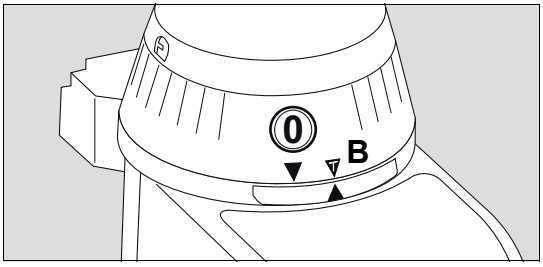
– during the warm-up phase

– during operation
The filling procedure takes a little longer when the vaporizer is warmed up. The anesthetic agent must have reached ambient temperature before filling. With a warmed-up vaporizer, cool anesthetic agent or tight anesthetic agent bottles, the filling time is increased. Filling time, see page 102.

Vaporizer is connected to the anesthesia workstation

Filling during operation: The fresh-gas flow can remain set.

Vaporizer not connected to the anesthesia workstation



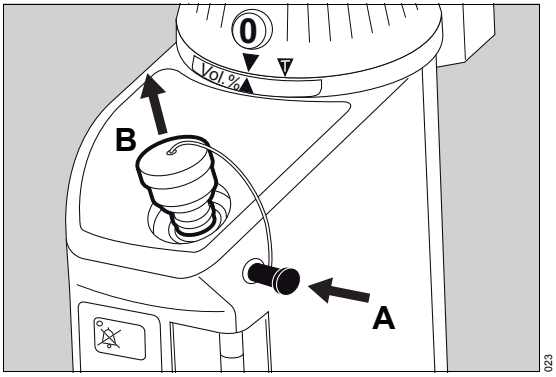
The control dial remains engaged in the ***T*** position (B).

Vaporizer with Baxter SAFE-FIL filling system for desflurane (Suprane)

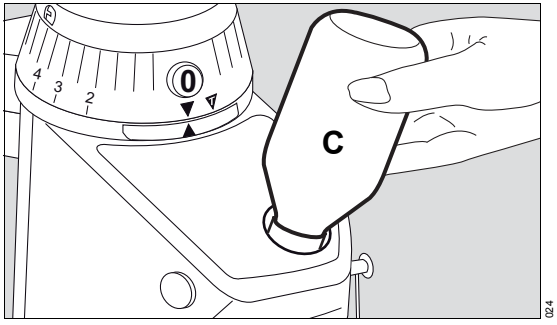
Starting the filling procedure

1 Unscrew the cap from the anesthetic agent bottle.

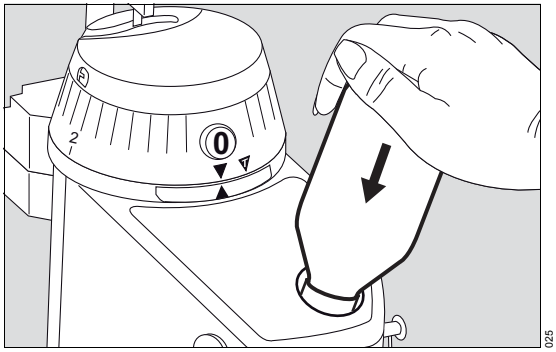
2 Ensure that the bottle, bottle connection, and O-ring on the bottle connection are not damaged.



3 Press the unlocking button (A) and withdraw the sealing plug (B) from the filling opening.



4 Insert the anesthetic agent bottle (C) into the filling opening. The anesthetic agent bottle will engage in the filling opening with an audible clicking sound.



5 Press the anesthetic agent bottle down and keep it pressed down.

Anesthetic agent will flow into the vaporizer. The contents of the bottle will show bubbles.

6 Watch the filling level in the sight glass. When the maximum mark is reached, the flow stops automatically.

7 If the Vaporizer is filled when it is warmed up, the contents of the tank will also bubble. Briefly interrupt the filling to check the fill level. To do this, stop pressing down the anesthetic agent bottle. Then press the bottle down again and continue with the filling.

8 Fill the vaporizer no higher than the maximum mark .

If the vaporizer is filled beyond the maximum mark, excess anesthetic agent may spray from the filling port when the bottle is removed.

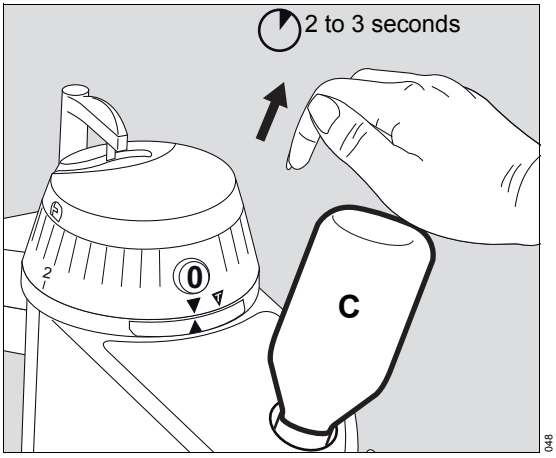
CAUTION

Health hazard

A bottle which is dropped may release significant quantities of anesthetic agent, if broken.

Do not use a broken bottle and remove it from the room.

Ending the filling procedure



1 Stop pressing down the anesthetic agent bottle (C).

Filling will be interrupted. The valve closes automatically and prevents any loss of anesthetic agent.

2 Wait 2 to 3 seconds while the anesthetic agent runs into the tank.

WARNING
Health hazard

Desflurane can spurt from the tank.

Wait 2 to 3 seconds while the anesthetic agent runs into the tank.

3 Press the unlocking button and slowly withdraw the anesthetic agent bottle from the filling opening.

4 Check the filling level in the sight glass. The vaporizer must be hanging or standing **vertically** during the check.

The filling level must be visible and must not be above the maximum mark.

5 Insert the sealing plug into the filling opening and press it down until the lock engages audibly.

6 Close the anesthetic agent bottle with the cap.

Vaporizer with Piramal Fill filling system for desflurane (Torrane)

CAUTION

Vaporizer not fillable

Only use desflurane bottles from Piramal. These bottles have the appropriate filling connector. Otherwise, the Vaporizer will not be filled.

Do not use excessive force.

WARNING

Danger to the user

The valve pin in the filling device must only be actuated by the Piramal desflurane bottle. Do not use any other object to depress the valve pin. Otherwise, desflurane may spurt.

WARNING

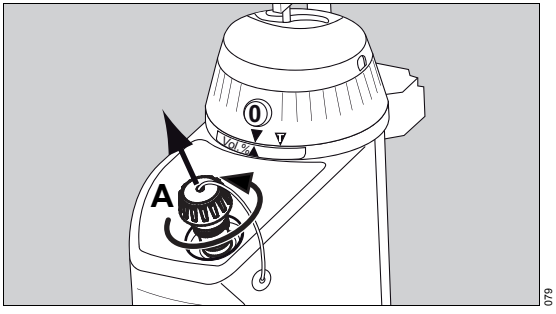
Spraying of anesthetic agent

If the bottle is not properly inserted into the filling port, the thread may jam and the bottle will open while the vaporizer is still closed. In this case, the anesthetic agent may spray out with considerable pressure.

Make sure that the filling connector of the bottle is correctly inserted into the filling port of the vaporizer and that the bottle threads are properly engaged with the port threads before screwing it into the filling system.

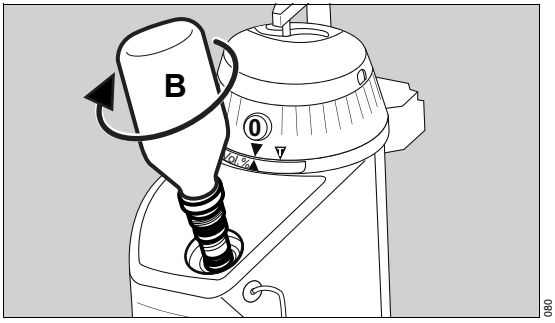
Starting the filling procedure

- Unscrew the cap from the anesthetic agent bottle. Check that the O-ring on the bottle connection is not damaged.



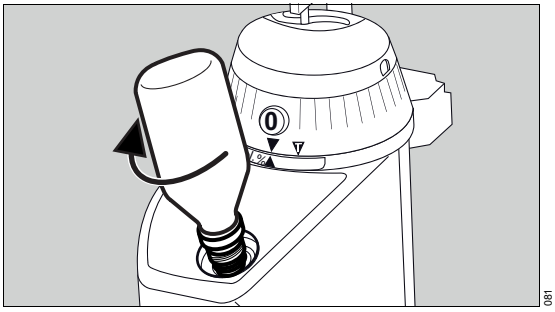
079

1 Remove the screw cap (A) from the filling port by unscrewing.



080

2 Insert the anesthetic agent bottle (B) firmly into the filling port, ensuring that the threads engage. Turn the bottle clockwise until a spring resistance can be felt. Do not tilt the bottle while turning it.



081

WARNING

Spraying of anesthetic agent

If the bottle continues to be turned after the bottle valve has been opened, anesthetic agent may spurt out with considerable force.

Do not continue to turn.

3 Turn the anesthetic agent bottle clockwise against the noticeable spring resistance until a higher noticeable resistance is reached.

The bottle valve is now open. Hold the bottle firmly in this position. Anesthetic agent will flow into the vaporizer. The contents of the bottle will show bubbles. Watch the filling level in the sight glass. Fill the vaporizer no higher than the maximum mark.

If the Vaporizer is filled when it is warmed up, the contents of the tank will also bubble. Briefly interrupt the filling to check the fill level.

If the vaporizer is filled beyond the maximum mark, excess anesthetic agent may spray from the filling port when the bottle is removed.

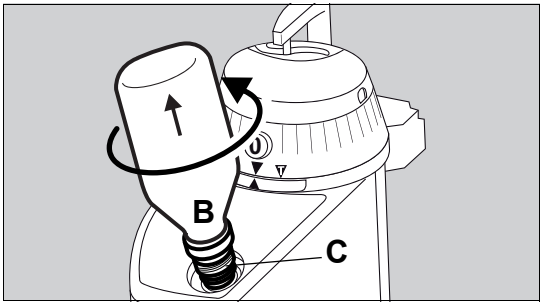
CAUTION

Health hazard

A bottle which was dropped may release significant quantities of anesthetic agent, if broken.

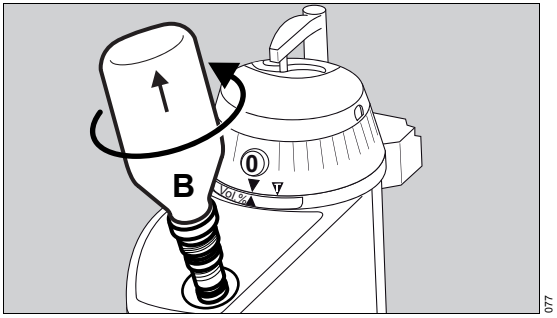
Do not use a broken bottle and remove it from the room.

Ending the filling procedure



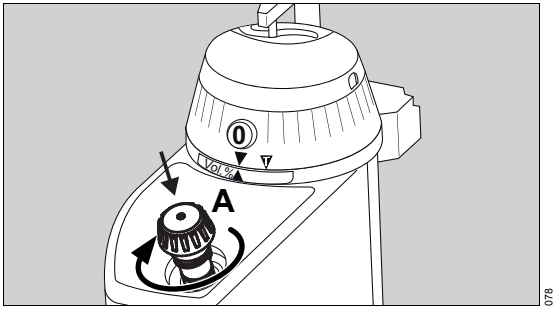
1 Slowly turn the anesthetic agent bottle (B) counterclockwise.

The spring in the integrated closure (C) ensures that the bottle valve closes and prevents loss of anesthetic agent. The filling procedure is completed.



2 Continue to slowly turn the anesthetic agent bottle and withdraw it from the filling port.

3 Check the filling level in the sight glass. The vaporizer must be hanging or standing vertically during the check. The filling level must be visible and must not be above the maximum mark.



4 Place the screw cap (A) in the filling port and screw it all the way in.

5 Close the anesthetic agent bottle with the cap.

Connecting the vaporizer

- Observe instructions for use of the anesthesia workstation.
- The control dial must be engaged in the ***T*** position.

WARNING

Risk of patient injury

Too high a fresh gas inlet pressure can result in a pressure monitoring error and thus to underdosing. The maximum fresh gas inlet pressure must not exceed 200 kPa (29 psi).

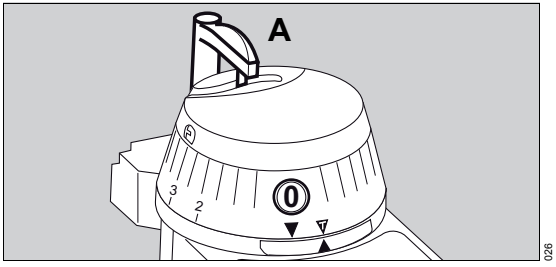
WARNING

D-Vapor only

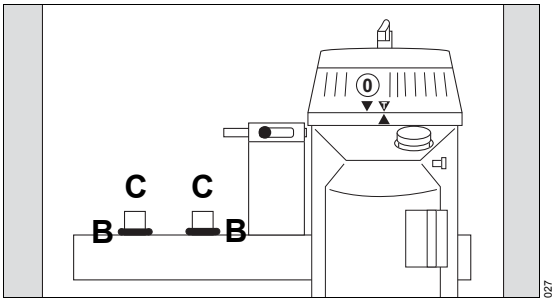
When using the anesthetic vaporizer D-Vapor on a Titus anesthesia workstation, check that the anesthesia workstation has been converted for operation with the anesthetic vaporizer model D-Vapor, see page 40.

D-Vapor 3000 is not suitable for use with Titus anesthesia workstations.

Vaporizer with plug-in adapter



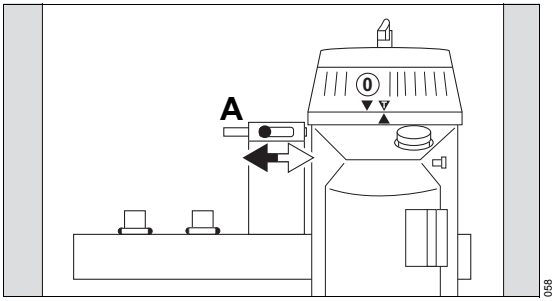
1 The locking lever (A) must be in position over the control dial.



2 On each pin of the plug-in connector (C), there must be one sealing ring (B) that must not be damaged. There should be no foreign objects on the plug-in connector.

Anesthesia workstations with several plug-in connectors

Two plug-in connectors and Interlock 2



- Before connecting the vaporizer, move the latch of the Interlock 2 (A) to the opposite position. If a vaporizer has already been connected and is in operation, the vaporizer must first be set to the ***0*** position.

Several Selectatec-compatible plug-in connectors

1 Switch off vaporizers on other plug-in connectors. Set the control dial to the ***0*** position.

Direct contact on the side Interlock pins is required for the Interlock system to operate. For triple plug-in connectors with built-in detection of the locking status between the outer plug-in positions, the middle plug-in position may remain unoccupied.

WARNING

Risk of patient injury

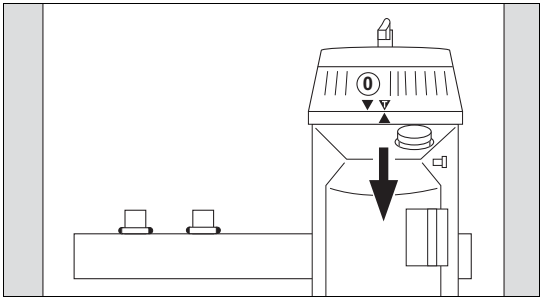
A malfunction in the Interlock system can endanger the patient by overdosing or mixing anesthetic agents.

On the Interlock S the side pins, which are extended when a vaporizer is switched on, must align axially. These pins must be next to each another on the vaporizers, and under no circumstances above each other.

Several Dräger Auto Exclusion plug-in connectors

A D-Vapor or D-Vapor 3000 with Auto Exclusion plug-in adapter can be connected to any free Dräger Auto Exclusion plug-in position.

Positioning the vaporizer on the plug-in connector



1 Hold the vaporizer in the vertical position with both hands and lower it gently onto the pins on the plug-in connector.

CAUTION

Risk of injury by trapping fingers

Take care when lowering the vaporizer onto its plug-in connector.

WARNING

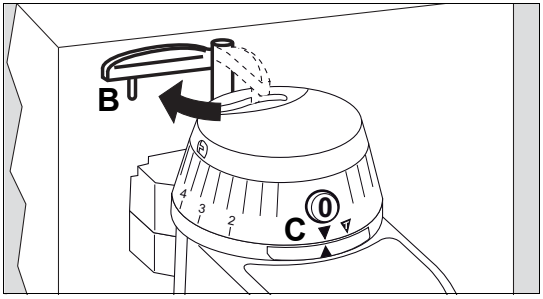
Risk of patient injury

Risk of fresh gas and anesthetic vapor escaping.

If the vaporizers are not correctly positioned or not correctly locked, this can result in a loss of fresh gas due to leaks, in low concentrations or in jamming of the Interlock interlock device.

The plug-in adapter must sit evenly and horizontally on the sealing rings.

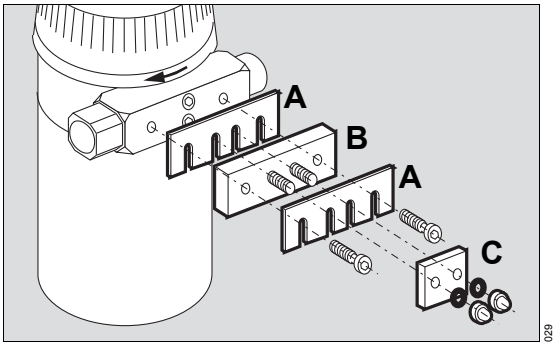
If loss of fresh gas, leaks, excessively low concentrations of anesthetic agent or jamming of the Interlock locking device occur, remove the vaporizer, see page 67, check the lever position and the engaging mechanism, then reconnect the vaporizer.



2 Swing the locking lever (B) clockwise by 90° until it engages. The vaporizer is then secured and cannot be removed.

3 Press the ***0*** button and set the control dial to the ***0*** (C) position.

D-Vapor with ISO conical adapter without interlock system



1 Insert the vaporizer in the fresh-gas line.

2 On anesthesia workstations with rigid conical connectors, adjustment plates (A) may be used for alignment:

- Between the connecting piece and the connecting plate and/or the connecting plate and the anesthesia workstation
- Ensure adequate screw length – at least 4 thread pitches. If necessary, use longer screws, strength at least 500 N/mm^2.

3 Fasten the connecting plate (B) to the connecting piece using M6 DIN 912-A4 screws; tightening torque (7 ±0.5) Nm.

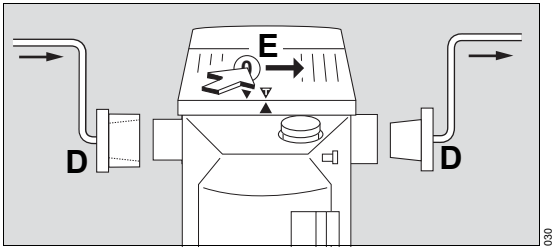
4 Tighten the vaporizer with a clamping plate and 2 M6 DIN 1587M-A4 cap nuts (C) and 2 A6.4 DIN 125-A4 washers.

WARNING

Risk of patient injury

Risk of incorrect output concentration and high resistance may affect breathing.

The vaporizer is not suitable for use in a breathing system.



5 Connect the gas inlet line and outlet line (D) to the vaporizer.

WARNING

Risk of patient injury

The wrong flow direction will result in incorrect concentration.

When connecting the vaporizer, make sure that the direction of flow is correct and corresponds to the arrow on the back of the vaporizer, see page 39.

6 Press the ***0*** button (E) and set the control dial to the ***0*** position.

CAUTION

Risk of injury and of damaging the vaporizer

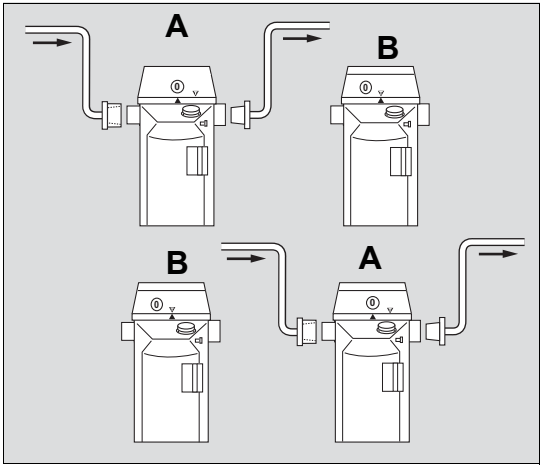
A free-standing vaporizer must be secured against tilting and falling.

WARNING

Mixtures, or concentrations that are too high may be delivered.

Make sure that only one vaporizer can be used at any one time or that only one vaporizer is connected at any one time.

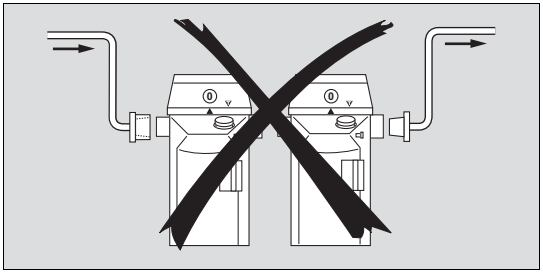
Setting the vaporizer which is not being used



1 Press the ***0*** button (A).

2 Engage control dial (B) at the ***T*** position.

Use of several vaporizers with ISO conical adapters



- Never connect the vaporizers in series!

WARNING

Danger to the patient from overdosing and/or mixing anesthetic agents

Without the Interlock system there is a danger that several vaporizers will be switched on and operational at the same time.

If this happens, gas containing anesthetic agent would flow from one vaporizer into the next vaporizer, resulting in uncontrolled mixtures.

Establishing electrical connections

Establishing the mains supply

WARNING

Health hazard

Do not use mains plugs or power cables that are damaged. There is a risk of electric shock otherwise.

WARNING

Health hazard

Only connect the medical device to a mains power supply with a protective ground. There is a risk of electric shock otherwise.

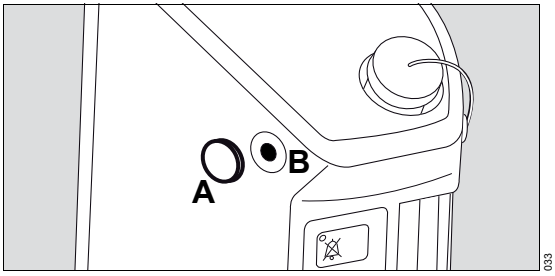
NOTE

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

- Plug the mains plug into the power socket.

Establishing potential equalization

Establish potential equalization, e.g., for intra-cardiac or intra-cranial surgery.



1 Remove the protective cap for the potential equalization bonding stud (A).

2 Connect one end of the potential equalization bonding conductor to the equipotential equalization pin (B).

3 Connect the other end of the potential equalization conductor to a central equipotential equalization pin.

Operation

Checking operational readiness

The readiness for use must be checked:
– after care and maintenance of the anesthesia workstation or the vaporizer
– after extended interruptions to operation, after 12 months at the latest

General condition of the vaporizer

- Associated instructions for use available.
- Last inspection less than 12 months previously.

1 No damage, no loose parts on the vaporizer.

2 The anesthetic agent indication on the vaporizer, the color code on the control dial cap and other anesthetic agent-specific codes, where present (e.g., the identification letters or code on the plug-in adapter) all correspond.

3 Gas inlet and gas outlet are not contaminated.

4 Power cable and mains plug are undamaged.

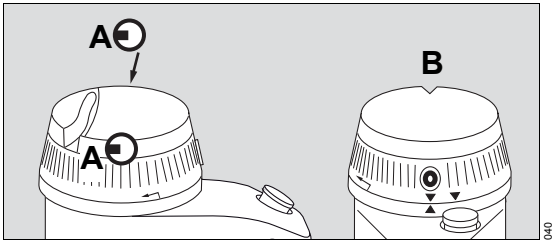
Control dial intact and functioning

1 Control dial cap sits firmly on the control dial.

2 Control dial engages both in the ***0*** position and in the ***T*** position and cannot be turned without the ***0*** button being pressed.

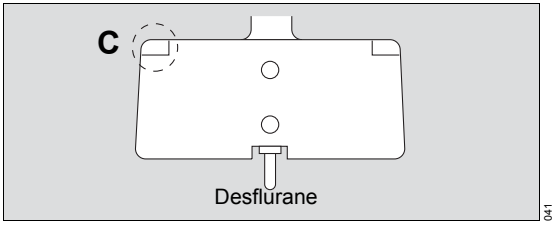
3 After the ***0*** button is pressed, the control dial can be turned as far as the end position near the 12 % marking. After the ***0*** button is pressed again, the control dial can be turned as far as the end position for the highest concentration marking.

Interlock intact and functioning



1 Interlock 2 and Dräger Auto Exclusion:
Tabs (A) in both openings present and undamaged.

2 D-Vapor
Interlock NMD only:
Notch (B) points to the rear when control dial is in the ***0*** position.



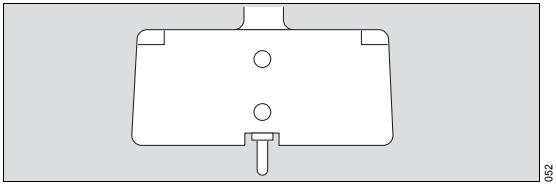
Note regarding the illustration: Plug-in adapters with anesthetic agent specific coding were supplied until 2005. New plug-in adapters do not have this coding.

3 Plug-in adapters with cut-outs in the upper corners (C) must not be fitted to a vaporizer with an Interlock NMD control dial cap.

DW-2000, Dräger Auto Exclusion and S-2000 plug-in adapters

Vaporizer not connected to the plug-in connector

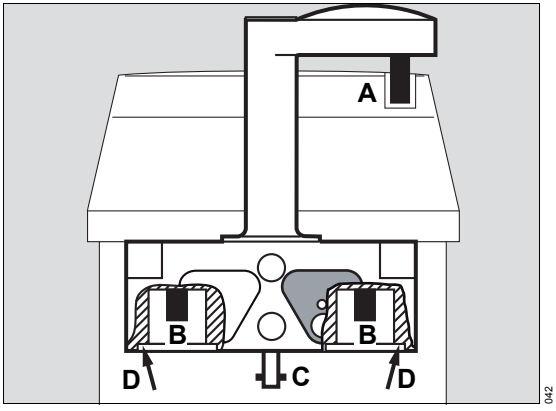
- Turn locking lever to locking position – it must turn back automatically.
  Re-engage locking lever in the control dial.



Newer versions of the DW-2000 plug-in adapter, Auto Exclusion plug-in adapters, and S-2000 plug-in adapters do not have any anesthetic agent code.

Plug-in adapter DW-2000 (D-Vapor only)

Only use **white** plug-in adapters for the D-Vapor.



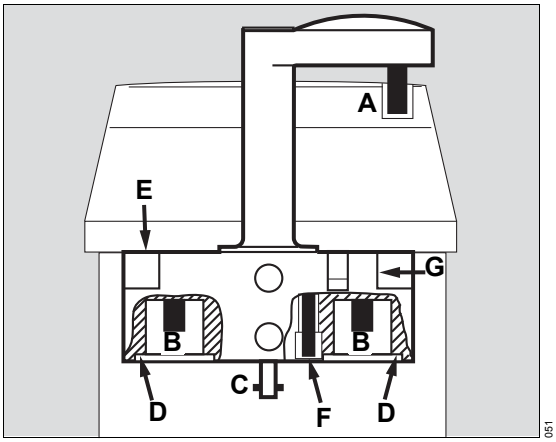
1 Drop-in pin (A) on locking lever secure and straight.

2 Both valve control pins (B) present.

3 Transverse pin (C) at the bottom of the locking lever is tight, in the center and not bent.

4 Sealing surfaces (D) undamaged.

DrägerAuto Exclusion plug-in adapter (D-Vapor/D-Vapor 3000)



1 Drop-in pin (A) on locking lever secure and straight.

2 Both valve control pins (B) present.

3 Transverse pin (C) at the bottom of the locking lever is tight, in the center and not bent.

4 Sealing surfaces (D) undamaged.

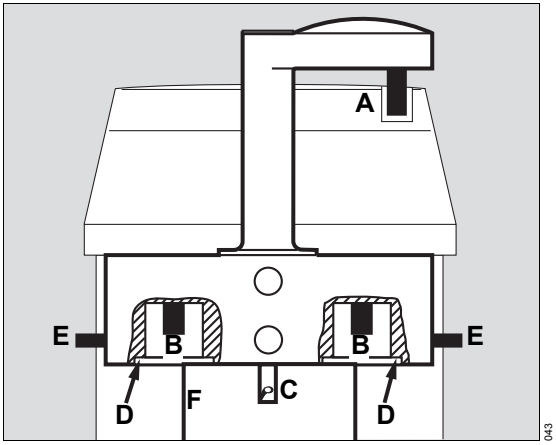
5 Cover plate (E) present and undamaged.

6 Auto Exclusion transmission pin (F) present, movable, and cannot be removed.

7 Bearing pin (G) present, tight and flush with housing.

Plug-in adapter S-2000 (D-Vapor only)

Only use **white** plug-in adapters for the D-Vapor.



1. Drop-in pin (A) on locking lever secure and straight.
2. Both valve control pins (B) present.
3. Stop mechanism (C) undamaged, not bent.
4. Sealing surfaces (D) undamaged.
5. Interlock pins (E) undamaged, glide easily, and cannot be removed.
6. Attachment plate (F) on the back of the vaporizer present and secure.

ISO conical adapter (D-Vapor only)

- Male cone connected to vaporizer inlet.
- Female cone connected to vaporizer outlet.
- Cones and sealing surfaces undamaged.

Permanent connection (D-Vapor only)

- Vaporizer fixed securely to connector.

Filling systems

Baxter SAFE-FIL filling system for desflurane (Suprane) and Piramal Fill filling system for desflurane (Torrane)

Discoloration and contamination of the anesthetic agent

- If there is contamination shown by discoloration, have the vaporizer repaired by specialized service personnel.

Concentration check

- Check the delivered concentration of anesthetic agent weekly when continuous monitoring is not available, see page 57.

Checking according to the checklist

- Check the vaporizer according to the checklist, see page 59.

Checking emergency power operation

Prerequisite: The battery has been charged for 1 hour.

- Set the flow to 4 L/min and the control dial to 6 Vol%.

The vaporizer must dose for 5 minutes in battery operation.

Checking the concentration

WARNING
Risk of patient injury

Incorrect concentrations of anesthetic agent can harm the patient.

If no continuous monitoring is present, the concentration must be checked weekly.

Prerequisite: The vaporizer is connected to the anesthesia workstation and ready for use.

Preparation

1 Fill the vaporizer at least to the middle marking on the sight glass.

2 Warm up the filled vaporizer and let it stand for 30 minutes in the "ready for operation" state.

3 Prepare the anesthetic agent monitor and check it. If necessary, perform a zero calibration with the required gas (Air or O_2).

4 Connect anesthetic agent monitor to vaporizer outlet, fresh-gas outlet, or Y-piece. Make sure that the connections are leak-tight.

5 Connect scavenging line and start operation.

Setting

1 Switch off the ventilator or set it so that the ventilation pressure is less than 5 hPa (5.1 cmH_2O).

2 Set the anesthesia agent monitor to desflurane and to continuous measurement.

3 Set the monitor to ***Vol%*** if possible.

4 Set a flow of 2.5 ±0.5 L/min Air.

Measuring

1 Check the ***0***, ***3***, ***8***, ***10*** and greater than ***14 Vol%*** markings.

Check the ***10 Vol%*** marking twice: Check the marking from the direction of a lower concentration and from the direction of a higher concentration.

2 Set the control dial.

3 Let the vaporizer dose for 1 to 2 minutes.

4 Take reading of measured value once it has stabilized.

NOTE
After an extended interruption to operation or if the tank has been emptied completely, there will be air as well as desflurane in the tank. Premature reading can result in incorrectly determined concentrations that are too low.

Correcting measured values

Correcting the units used on the anesthetic agent monitor

If the display on the monitor is

in Vol%:	No correction
in % partial pressure:	Convert to Vol%:

$$\text{Concentration [Vol\%]} = \frac{\text{Measured value [\% partial pressure]} \times 1013\ \text{hPa}}{\text{Atmospheric pressure [hPa]}}$$

Determining the permissible range

Refer to accuracy data (see page 101) for permissible range of concentration.

Determine the permissible deviation of the anesthetic agent monitor.

The sum total of both sets of accuracy data is the permissible range for the output concentration.

Test results

If all the corrected measured values are within the permissible range:

The vaporizer may be put into operation.

WARNING
Risk of injury to the patients

If the corrected measured values are not within the permissible range, do not use the vaporizer.

Have the vaporizer checked by service personnel. Check the anesthetic agent monitor.

After the test

If the vaporizer is on an anesthesia workstation:

- Switching off the vaporizer: Engage the control dial in the ***0*** position.

If the vaporizer is not on an anesthesia workstation:

- Press the ***0*** button and set the control dial to the ***T*** position. With plug-in adapter, engage locking lever in control dial.
- Shut off the Air flow.

Example of a concentration check

Test of a desflurane vaporizer at the 8 % setting

– The measured value is 8.58 Vol%.

  Monitor display is in Vol%, therefore no correction.

– According to the chapter "Technical Data", the permissible range of the vaporizer is ±15 % of the set value, i.e. 6.8 to 9.2 Vol%.

  The technical data for the anesthetic agent monitor lists an accuracy of ±5 % rel. For a measured value of 8.58 Vol%, this results in a tolerance of ±0.43 Vol%.

  The permissible range is increased by this amount to a value of 6.37 to 9.63 Vol%.

– The measured value of 8.58 Vol% is in the permissible range.

Putting into operation

Checklist – Checks before each use

The following checks must be carried out each time before operation:

Conditions

1 Operating parameters (e.g., temperature) are in the range specified for the application

2 If necessary, wait for the temperature to equalize to ambient temperature (e.g., after transport)

3 Operation in magnetic fields is not allowed (e.g., in rooms with magnetic resonance tomograph)

4 Operation at an angle, e.g., in portable anesthesia workstations:

WARNING

Danger to the patient, risk of injury, and damaging the vaporizer

At an angle of more than 10°, an unsecured vaporizer may topple over.

If a vaporizer is operated at an angle of more than 10°, uncontrolled concentrations may occur.

Do not operate the vaporizer when it is at an incline of more than 10°.

WARNING

Health hazard

Connections and plug-in connectors/adapters can leak at greater tilt angles. The filling level shown in the sight glass will not be correct when the vaporizer is used at an angle! This may result in overfilling.

Do not operate the vaporizer when it is at an incline of more than 10°. Make sure the vaporizer is standing upright or hanging vertically while it is being filled.

5 Anesthesia workstation prepared in accordance with instructions for use and anesthetic gas scavenging system connected.
The scavenging line for taking up and leading away anesthetic gases must conform to the ISO 80601-2-13 standard.

6 Anesthetic gas monitor, conforming to the ISO 21647 or ISO 80601-2-55 standard, switched on. Correct anesthetic agent and alarm limits set.

WARNING

In accordance with ISO 21647 or ISO 80601-2-55, continual monitoring with upper and lower alarm limits to detect any hazardous output values due to deviations in concentration, leakage, or incorrect filling is required. For this reason, use a monitor that can differentiate between different anesthetic agents.

The operability of the measuring instrument must be insured before you use it.

Observe the instructions for use for the monitor.

WARNING

During low-flow operation and minimal-flow operation, the concentration in the breathing system may deviate significantly from the vaporizer setting. For this reason, measurement of the inspiratory and/or expiratory anesthetic agent concentration is required.

WARNING

Risk of patient injury

Incorrect output concentrations will not be detected when operating from the external fresh-gas outlet.

An anesthetic gas monitor must be used if the vaporizer is used with anesthesia machine via the external fresh-gas outlet.

7 O_2 monitor switched on. Alarm limits set.

WARNING

In accordance with ISO 21647 or ISO 80601-2-55, use of a continually measuring oxygen monitor with an alarm system for detecting insufficient oxygen supply, e.g., due to leakage, is required.

8 When CO_2 accessory equipment (CO_2 module) is used for dosing CO_2 on the anesthesia workstation, CO_2 may be conducted through by the vaporizer. Observe instructions for use of the anesthesia workstation.

Checking for damage

- Check the vaporizer for visible damage.
- Check the power cable and mains plug for visible damage.
- Check that the power cable is not trapped between the vaporizer and the anesthesia workstation. Observe the instructions for use for the anesthesia machine.

Checking the filling level

- Filling level in sight glass sufficiently high above minimum mark – must not exceed maximum mark.

Checking the filling device

- Filling device for the Baxter SAFE-FIL filling system for desflurane (Suprane): Sealing plug inserted and engaged.
- Filling device for the Piramal Fill filling system for desflurane (Torrane): Opening on the filling device closed. Screw cap correctly fitted and tightened.

Checking the connection system

- Plug-in connector:
  Plug-in adapter sits evenly on the seals. Locking lever swung to the left. Vaporizer is hanging vertically on machine, when viewed from front and side, and cannot be lifted off.
- Other connectors:
  Vaporizer connected firmly and securely on anesthesia workstation. Vaporizer is hanging or standing upright and is secured against tilting or falling.
- Direction of flow corresponds to arrow on vaporizer.

If there are several connectors, check connector allocation and Interlock

1 All connectors allocated.

2 The following unallocated connectors must not be open during operation:

D-Vapor	D-Vapor 3000
Permanent connections	–
ISO conical adapter	–
Plug-in connectors without valve function	Plug-in connectors without valve function

WARNING

Risk of insufficient supply to the patient

Non-allocated, open connections will result in a loss of fresh gas and anesthetic agent. The supply to the patient will be interrupted.

Non-allocated connectors must not be open during operation.

3 Only one vaporizer connected at a time. If not:

- Check that there is an Interlock system on the vaporizer and anesthesia workstation, and that it is of same type. For differentiating features, see page 54.

WARNING

A malfunction in the Interlock system can endanger the patient by overdosing or mixing anesthetic agents.

The tabs in the two openings in the control dial cap on the Interlock 2 must be undamaged. See also the chapter "Checking operational readiness" on page 54 for more information.

On the Interlock S the side pins, which are extended when a vaporizer is switched on, must align axially. On the vaporizers, these pins must be next to each other and never above each other.

4 Fresh-gas flow must be switched off.

Checking each connected vaporizer:

5 Set the vaporizer to any desired concentration.

6 All other vaporizers must be switched off, locked, and impossible to switch on.

7 If there is a vaporizer recognition system present, check that the correct anesthetic agent is indicated and that it matches the connected vaporizer.

WARNING

Risk of patient injury

The vaporizer will be set to incorrect concentration values.

If the vaporizer recognition does not indicate the same anesthetic agent as that for which the vaporizer is calibrated, incorrect concentration values will be indicated.

Check that the correct anesthetic agent is indicated and that it matches the vaporizer connected.

8 Switch off the vaporizer – the control dial is engaged in the ***0*** position.

9 Check that the vaporizer, connector, and fresh-gas lines are leak-tight (see the instructions for use of the anesthesia workstation):

- at control dial setting ***0*** or ***T***
- at control dial setting ≥***2 Vol%***.

10 Flush the breathing system with fresh gas before connecting a patient.

WARNING

Do not operate the vaporizer if the checks were not successfully completed. Repair by specialized service personnel.

Switching on and self-test

WARNING

Health hazard

Only connect the device to a mains power supply with a protective ground. There is a risk of electric shock otherwise.

- Plug the plug of the power cable into the power socket. The self-test will start.

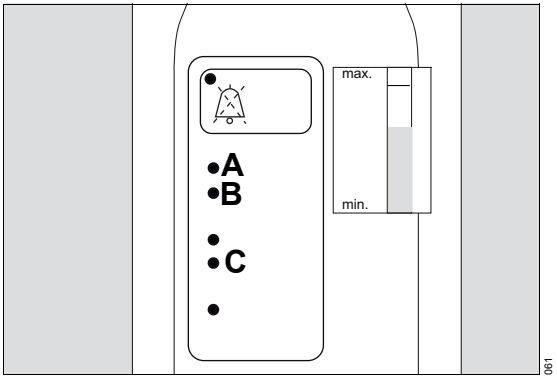
WARNING

Risk of patient injury

Do not use the vaporizer if one of the 6 LEDs does not light during the self-test and the audible signal does not sound. Repair by specialized service personnel.

Only use functioning vaporizers.

Self-test sequence



– First a tone sounds briefly.

– All 6 LEDs light for several seconds.

– A tone then sounds briefly and 5 LEDs go out.

– The green ***Operational*** LED (A) flashes, indicating that the vaporizer is warming up.

– After the warm-up phase (up to 5 min), a tone sounds briefly. The green ***Operational*** LED (A) lights continuously. If the vaporizer is cold (e.g., immediately after transport), the warm-up phase will be extended.

The vaporizer is ready for use. The control dial can be unlocked and the desired concentration set.

Alarm cases

If the control dial is operated while the green ***Operational*** LED is flashing, an alarm tone sounds and the red ***No Output*** LED (B) flashes. No anesthetic agent will be dispensed.

If the green ***Operational*** LED is still flashing after 20 minutes' warm-up, contact specialized service personnel, see "Alarm cases" on page 78.

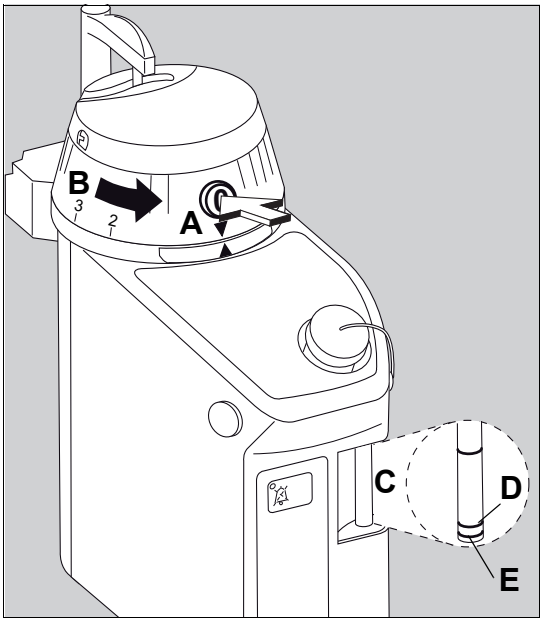
If the yellow ***Fill Up*** LED (C) is lit, fill the vaporizer, see "Filling the Vaporizer" on page 42.

Adjusting concentration of anesthetic agent

- First set the flow of fresh gas on the anesthesia workstation.

NOTE

If fresh-gas flow is greater than 10 L/min, flow noises may occur in the vaporizer. The noises are not a result of leakage. Anesthetic gas is not being released.



Note regarding the illustration: To improve the representation, the sight glass is shown here without any anesthetic agent.

If the control dial is set to the ***T*** position:

1 **Press** the ***0*** button (A) and turn the control dial (B) counterclockwise to the required anesthetic agent concentration. A short tone sounds.

For settings >12 Vol%:

Exceeding 12 Vol% is restricted by an interlock.

- Press the ***0*** button (A) **again** and turn the control dial (B) counterclockwise to an anesthetic agent concentration >12 Vol%.

If the concentration is being reduced from >12 Vol% to <12 Vol%, it is not necessary to press the ***0*** button.

If the concentration cannot be set:

- Do not force the control dial.
- Check that all other vaporizers connected are in the ***0*** or the OFF position and that Interlock it is functional.

WARNING

Do not make any settings between the *0* and the *2 Vol%* positions!

The concentration is not defined in this range.

2 Check the filling level in the sight glass (C) regularly. The filling level must be **visible** between the minimum and maximum marks.

3 When the refill mark (D) has been reached, up to 240 mL of desflurane may be refilled using an anesthetic agent bottle.

4 Fill the vaporizer at the latest when the minimum mark (E) is reached, see page 42.

WARNING

Risk of patient injury

If the anesthetic agent monitor shows implausible values, check the vaporizer for incorrect filling and the monitor for incorrect setting.

WARNING

Concentration too low

If the underdosing alarm occurs:

- **Correct the setting, see "Influence of flow" on page 110.**

If the alarm continues:

- **Observe the anesthetic gas measurements on the monitor. Set control dial to the *0* position. Disconnect the mains power supply. Remove the vaporizer from the anesthesia workstation. Contact specialized service personnel.**

WARNING

Concentration too low

During operation with both high fresh-gas flow and high concentration, the actual delivered concentration may decrease, see "Influence of flow" on page 110.

An anesthesia workstation may be moved with the vaporizer switched on.

WARNING

Jerky movements or tilting at an angle of more than 10° can cause wrong dosage.

Changing the anesthetic agent

- Set the vaporizer being used to the ***0*** position.

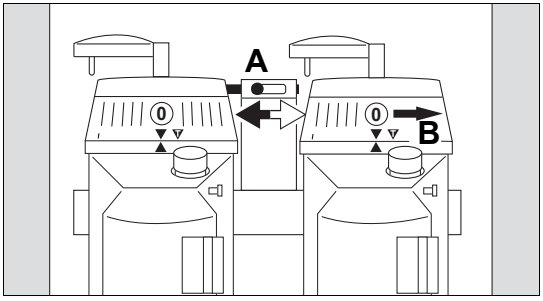
If only one vaporizer is connected or if one of the connected vaporizers is to be replaced

1 Disconnect the vaporizer, see page 67.

2 Connect the new vaporizer, see page 48.

3 Switch the anesthetic agent monitor to the new anesthetic agent.

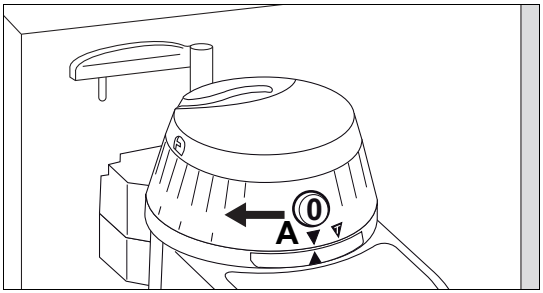
Two vaporizers with Interlock 2



1 Slide the latch of the Interlock 2 (A) into the control dial on the vaporizer which has been used until it engages.

2 On the vaporizer to be used, press the ***0*** button and set the control dial (B) to the concentration of anesthetic agent required.

Ending delivery of anesthetic agent



WARNING

The fresh-gas flow must not be switched off before the vaporizer is switched off. The vaporizer must not be left switched on without a fresh-gas flow.

Anesthetic agent vapor at a high concentration can get into machine lines and ambient air and harm people and materials.

- Switch off the vaporizer. To prevent it from being switched on accidentally: Engage the control dial (A) in the ***0*** position.

Then, if required:

- Switch off fresh-gas flow on the anesthesia workstation.

NOTE

The vaporizer is ready for operation as long as the mains plug is plugged in.

If the vaporizer is disconnected from the mains power supply, it will be switched off completely.

Operation during mains power failure (battery operation)

The vaporizer has an internal battery which keeps it operating for a maximum of 5 minutes in the event of a mains power failure.

Prerequisite:

Battery present in the vaporizer and is connected and sufficiently charged, "Before first use" on page 38.
If the battery is not adequately charged or is defective, the yellow ***Battery*** LED lights, see "Alarm cases" on page 78. Battery operation is not or is only partially available.

With an adequately charged battery, the vaporizer can continue operating during a mains power failure for a maximum of 5 minutes (at a maximum dosing rate of 6 Vol% and a fresh-gas flow of 4 L/min). Approx. 30 seconds after the mains power supply failure, a medium-priority alarm will be generated. The yellow ***Battery*** LED flashes and a suppressible alarm tone sounds.

If the mains power failure ends before 5 minutes have elapsed, the vaporizer reverts to mains operation.

The vaporizer switches off after a maximum of 5 minutes battery operation. A high priority alarm is generated: the red ***No Output*** LED and the yellow ***Battery*** LED flash and the corresponding alarm tone sequence sounds.

The vaporizer must not be filled during battery operation.

Operational interruptions

If the vaporizer is not going to be used for up to 6 months, it may remain filled.

If the vaporizer is not going to be used for more than 6 months, see "End of operation – draining the vaporizer" on page 69.

- Observe the use-by date and storage conditions for the anesthetic agent.

Vaporizer remains on device

- Disconnect the vaporizer from the mains power supply.
- Locking lever on the plug-in adapter should remain locked off.
- Keep within the permissible temperature range, see page 100.

If the vaporizer is disconnected or transported

- Disconnecting the vaporizer, see page 67.
- Transporting the vaporizer, see page 68.

Disconnecting the vaporizer

WARNING

Risk of injury and of damaging the vaporizer

The vaporizer can fall over.

Disconnect the mains plug before removing the vaporizer.

WARNING

Risk of injury and of damaging the vaporizer

Take care not to drop the vaporizer. Do not use the vaporizer if it has been dropped. Damage may cause incorrect output concentration.

Do not carry the vapor by the control dial, control dial cap or locking lever for the plug-in adapter.

CAUTION

Risk of injury and of damaging the vaporizer

Place the vaporizer only on firm, horizontal surfaces or hang it from sturdy brackets.

NOTE

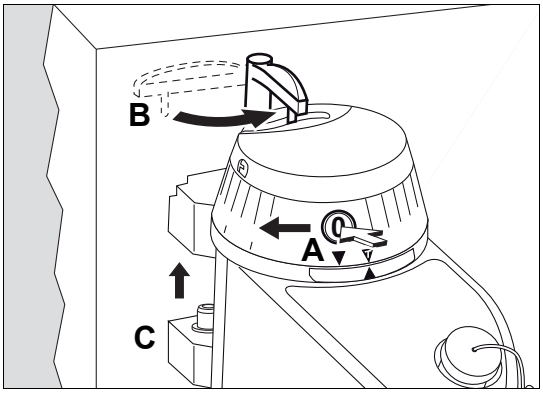
Disconnect the vaporizer only when the control dial is set to the ***T*** position.

Plug-in connector

DW-2000 plug-in adapter and S-2000 plug-in adapter (D-Vapor only)

1 Set the control dials of adjacent anesthetic vaporizers to ***0*** or OFF.

2 For two plug-in connectors and Interlock 2: Slide the latch to the opposite position.



3 Press the ***0*** button and turn the control dial (A) clockwise to the ***T*** position.

4 Turn the locking lever (B) 90° counterclockwise and engage it in control dial.

5 The vaporizer can now be lifted off (C) the plug-in connector smoothly, using both hands.

WARNING

Fresh gas and anesthetic agent vapor can escape.

For plug-in connectors without valves, the fresh-gas supply is interrupted when the vaporizer is disconnected.

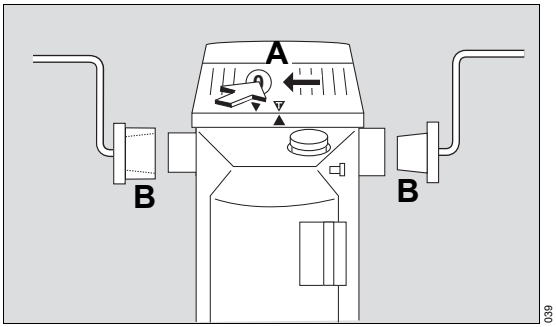
Plug-in adapter Auto Exclusion (D-Vapor/D-Vapor 3000)

1 Press the ***0*** button and turn the control dial clockwise to the ***T*** position.

2 Turn the locking lever (B) 90° counterclockwise and engage it in control dial.

3 The vaporizer can now be lifted off (C) the plug-in connector smoothly, using both hands.

ISO conical adapter (D-Vapor only)



1 Press the ***0*** button (A) and turn the control dial clockwise to the ***T*** position.

2 Disconnect the gas inlet line (B) and outlet line (B) from the vaporizer.

3 The vaporizer can now be disconnected.

WARNING

Fresh gas and anesthetic agent vapor could escape.

When the ISO conical adapter is used, the fresh-gas line is interrupted when the vaporizer is disconnected.

4 In order to re-establish the fresh-gas delivery to the breathing system, the gas feeding inlet line and gas outlet lines must be connected securely together.

Permanent connection (D-Vapor only)

Only specialized service personnel may disconnect it.

Transport when filled

A vaporizer may be transported separately or, for instance, along with the transportable anesthesia workstation to which it is connected:

– Only as part of normal clinical operation, not for storage and dispatch. See "Storage" on page 72 and "Dispatch" on page 72.

– Only when ambient conditions are in accordance with "Technical Data" on page 99.

- Disconnect detachable vaporizers from the anesthesia workstation and transport individually.

The anesthesia workstation may be moved with the vaporizer switched on.

WARNING

Jerky movements or tilting at an angle of more than 10° can cause wrong dosage.

Anesthesia workstations with securely fastened vaporizers

- Anesthesia workstations with securely fastened vaporizers may be moved within or between buildings with the control dial set at ***0*** or ***T*** if there is no risk of tilting by more than 10°.

Notes on transport

- Always engage the control dial in the ***T*** position.
- Always make sure that vaporizer is appropriately secured against tilting or falling for the particular means of transport in compliance with the instructions for use of the anesthesia workstation and that it is packed safely to prevent damage.

NOTE

An upright position for the vaporizer is recommended, but all orientations are permissible with the control dial in the ***T*** position.

End of operation – draining the vaporizer

- Disconnect the vaporizer from the mains power supply.

Only have the vaporizer drained by service personnel.

CAUTION

Health hazard

Take care not to spill anesthetic agent.

Do not inhale anesthetic agent vapor.

Recommendation: Drain the vaporizer and make sure there is adequate ventilation, as small quantities of anesthetic agent vapor are always released.

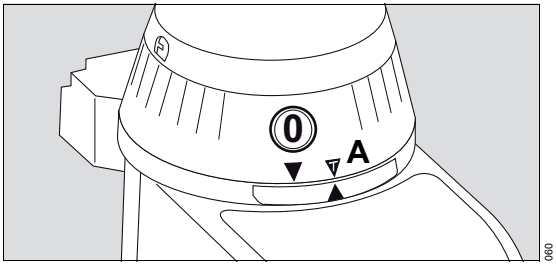
- Avoid contamination during draining.

WARNING

Risk of administering the incorrect anesthetic agent or anesthetic agent mixtures.

Anesthetic agent which has been drained off must be handled, stored and disposed of as a pharmaceutical drug in accordance with the hospital regulations and the statutory provisions of the country of use.

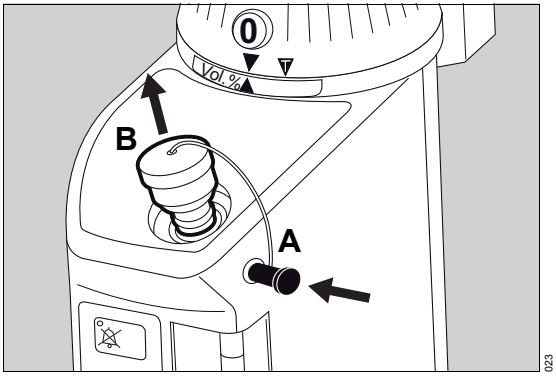
Vaporizer not connected to the anesthesia workstation



- The control dial remains engaged in the ***T*** position (A).

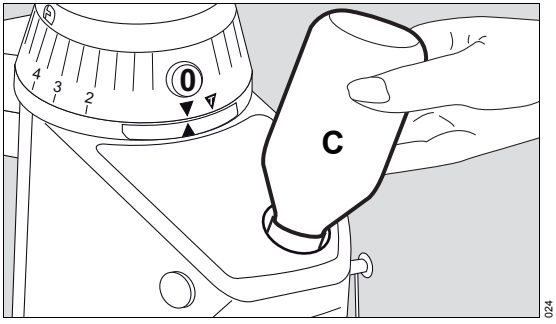
Vaporizer with filling device of the Baxter SAFE-FIL filling system for desflurane (Suprane)

Draining the vaporizer



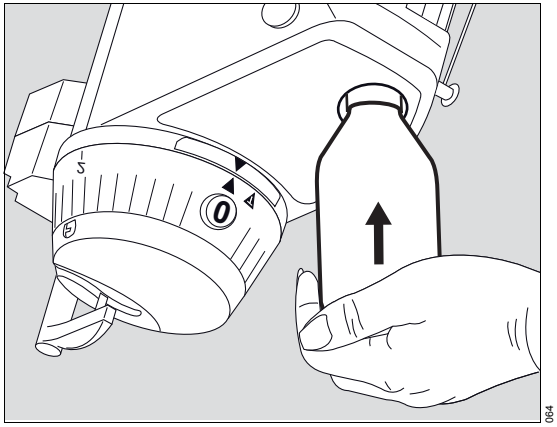
1 Press the unlocking button (A) and withdraw the sealing plug (B) from the filling opening.

2 Take an undamaged anesthetic agent bottle provided by Baxter for desflurane (Suprane). Unscrew the cap.



3 Insert the anesthetic agent bottle (C) into the filling port. The anesthetic agent bottle will engage in the filling opening with an audible clicking sound.

4 Turn the vaporizer upside down until the anesthetic agent bottle is hanging vertically downwards.



5 Push the anesthetic agent bottle from below into the filling opening. Anesthetic agent will flow from the tank into the anesthetic agent bottle.

6 Drain until the tank is empty or the bottle is full. Stop pushing the anesthetic agent bottle from below into the filling opening. Position the vaporizer upright again. Press the locking button and remove the anesthetic agent bottle. To remove the 30 mL remaining in the vaporizer, see "Blowing off the vaporizer" on page 71.

7 If necessary, repeat the procedure with an empty anesthetic agent bottle.

Ending the draining

1 Insert the sealing plug into the filling opening and press it down until the lock engages audibly.

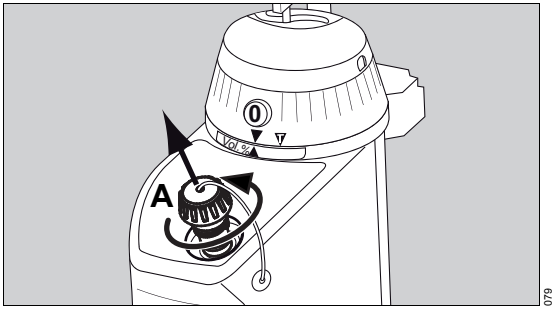
2 Close the anesthetic agent bottle with the cap.

3 Mark the bottle:
"Used anesthetic agent."
Recommendation: Do not reuse.

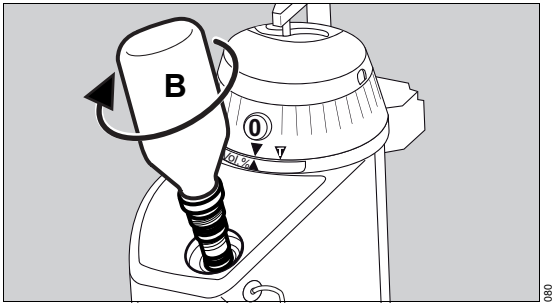
Vaporizer with filling device for the Piramal Fill filling system for desflurane (Torrane)

Draining the vaporizer

- Use an undamaged anesthetic agent bottle provided by Piramal for desflurane (Torrane). Unscrew the cap.

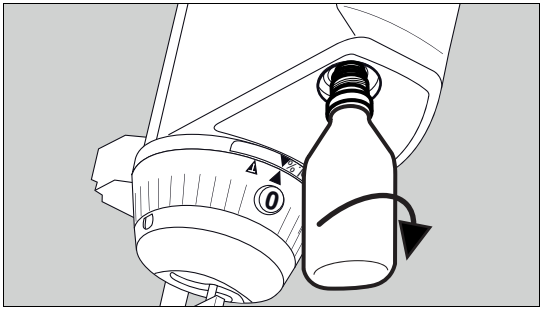


1 Remove the screw cap (A) from the filling port by unscrewing.



2 Insert the anesthetic agent bottle (B) into the filling port. Turn the bottle clockwise until a spring resistance can be felt. Do not tilt the bottle while turning it.

3 Turn the vaporizer upside down until the anesthetic agent bottle is hanging vertically downwards.



WARNING

Spraying of anesthetic agent

If the bottle continues to be turned after the bottle valve has been opened, anesthetic agent may spurt out with considerable force.

Do not continue to turn.

4 Turn the anesthetic agent bottle against the noticeable spring resistance until a higher noticeable resistance is reached.

The bottle valve is now open. Hold the bottle firmly in this position. Desflurane flows from the tank into the anesthetic agent bottle.

5 Drain until the tank is empty or the bottle is full.

6 Slowly turn the anesthetic agent bottle (B) counterclockwise.

The spring in the integrated closure (C) helps the bottle valve close. The draining procedure is completed.

7 Position the vaporizer upright again.

8 Continue to slowly turn the anesthetic agent bottle and withdraw it from the filling port.
To remove the residual desflurane left in the vaporizer, see "Blowing off the vaporizer" on page 71.

If necessary, repeat the procedure with an empty anesthetic agent bottle.

Ending the draining

1 Place the screw cap (A) in the filling port and screw it all the way in.

2 Close the anesthetic agent bottle with the cap.

3 Mark the bottle:
"Used anesthetic agent."
Recommendation: Do not reuse.

Blowing off the vaporizer

If the anesthetic agent remaining in the tank also has to be removed after complete draining:

1 Connect the vaporizer to the mains power supply and put it into operation.

2 Set the control dial to 18 Vol% and flush with 10 L/min air until the ***Delivery Low*** alarm is triggered.

3 Allow gas to flow into the scavenging line.

4 Press the ***0*** button and set the control dial to the ***T*** position.
Plug-in adapters: engage locking lever in control dial.

5 Disconnect the vaporizer from the mains power supply.

Storage

Storage for longer than 6 months

1 Draining the vaporizer, see page 69. Blowing off the vaporizer, see page 71.

2 Press the ***0*** button and set the control dial to the ***T*** position.
Plug-in adapters: engage locking lever in control dial.

3 The vaporizer may be stored in any position.

4 Pack if necessary, see "Dispatch" on page 72.

WARNING

Internal damage to the vaporizer and incorrect output concentrations

Internal damage to the vaporizer may occur if the storage temperature range is exceeded. Observe the storage temperatures, see page 100.

Do not use the vaporizer otherwise. Have inspection carried out.

NOTE

Before putting into operation again, carry out inspection and test for operational readiness.

Dispatch

1 Completely drain the vaporizer, see page 69. Clean and disinfect the vaporizer, see page 89.

2 Engage control dial in the ***T*** position.

3 To dispatch anesthesia workstations, remove the vaporizers if they are not permanently connected.

4 Carefully pack each vaporizer separately! Use the original packaging if possible. If the original packaging is not available, use strong packaging with at least 5 cm (2 in) of impact-resistant material around each vaporizer. Fasten the packaging securely.

WARNING

Airfreight:
When transported as airfreight, liquid anesthetic agents and filled vaporizers are subject to the IATA/ICAO Hazardous Goods Regulations (UN 3334 "Aviation regulated liquid, n.o.s. (anesthetic agent)", Class 9) if they have been drained but not blown out.

NOTE

Road and sea transport:
When transported by road or sea, liquid anesthetic agents and filled vaporizers are not subject to any hazardous goods regulations unless national regulations preclude it.

Alarms

Alarm concept

D-Vapor/D-Vapor 3000 has a visual and audible alarm system conforming to IEC 60601-1-8. In addition, the Vaporizer has a secondary audible alarm system.

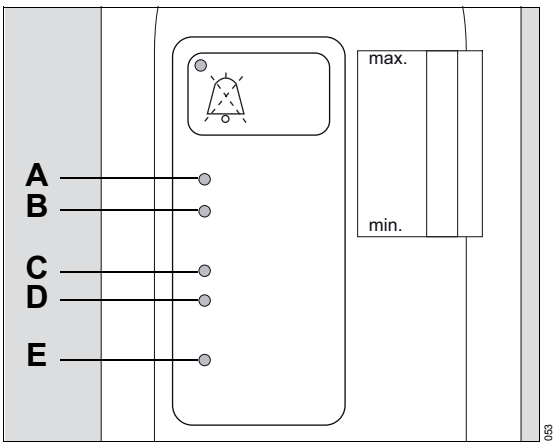
Alarm priorities and alarm signals

Alarms are classified into priorities according to urgency. There are different visible and audible signals for the various priorities.

Warning	Alarm with high priority	Immediate action required to avert an acute hazard	Red LED flashes quickly	Two tone sequences with 5 tones each, every 9 seconds: 
Caution	Alarm with medium priority	Prompt action required to avert an acute hazard	Yellow LED flashes	One tone sequence with 3 tones, every 24 seconds:

Note	Signal for note	Attention required, delayed response is sufficient	Yellow LED lights permanently	One short tone

Optical alarm signals



A Green LED ***Operational*** (does not represent any alarm priority, but indicates correct operation)

B Red LED ***No Output***

C Red LED ***Delivery Low***

CAUTION

The ***Delivery Low*** alarm is only generated with certainty when there is a fresh-gas flow of at least 1.2 L/min.

D Yellow LED ***Fill Up***

E Yellow LED ***Battery***

List of the causes and remedies for an alarm, see "Alarm cases", page 78.

Secondary audible alarm system

The secondary audible alarm system is only in active operation when there is a mains power failure (battery operation).

Alarm	Cause	Remedy
Continuous tone ≥7 s	Mains supply failure; no further battery operation possible.	Turn control dial to the ***0*** position. Change to a vaporizer that does not require a mains supply.
Continuous tone	Dosing request when the vaporizer is not connected to the mains power supply.	Turn control dial to the ***0*** position. Connect the vaporizer to the mains power supply; wait for the warm-up phase. Set the selected concentration.

Suppressing the alarm tone

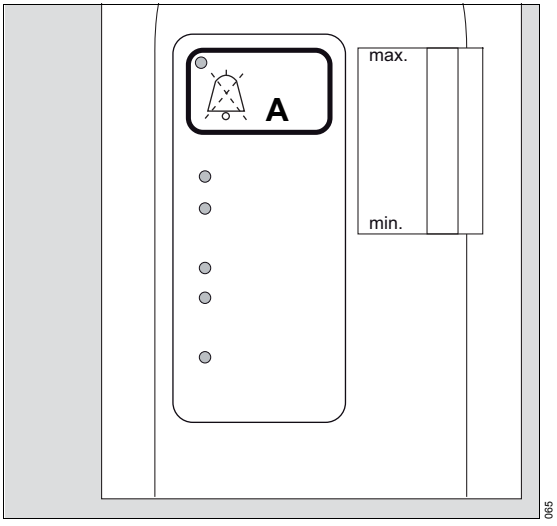
By using the ***Audio paused 2 min*** key (A), medium priority alarms can be audibly suppressed for 2 minutes. The yellow LED in the button lights during this time. The alarm continues to be indicated by the corresponding LED.

Alarm suppression can be deactivated by one of the following actions:

– The cause of the fault is resolved.

– The control dial is set to the ***0*** position.

Lists of the causes and remedies for a fault, see chapter "Problem solving", page 77.



- Press the ***Audio paused 2 min*** key (A).

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Problem solving

Problems

Possible faults are listed in the following tables. The tables will help to identify the underlying cause and to quickly remedy it using the measures provided. The different causes and remedies should be worked through in the order listed until the fault has been resolved.

Alarm cases

Priority	Alarm indication	Cause	Remedy
Warning	All LEDs flashing.	Equipment fault	Take equipment out of service. Set control dial to the ***0*** position. Disconnect the mains power supply. Remove the vaporizer from the anesthesia workstation if possible. Repair by specialized service personnel.
Warning	Green ***Operational*** LED flashes. Red ***No Output*** LED flashes.	Dosing request during warm-up phase Malfunction	Set control dial to the ***0*** position. Wait until the green ***Operational*** LED is lit continuously.
Warning	Red ***No Output*** LED flashes. Yellow ***Battery*** LED flashes.	End of battery operation	Set control dial to the ***0*** position. Change to a vaporizer that does not require a mains supply.

Priority	Alarm indication	Cause	Remedy
Warning	Green ***Operational*** LED is lit. Red ***Delivery Low*** LED flashes.	Underdosing Setting for concentration and/or fresh-gas flow too high (only for fresh gas flow >6 L/min).	Correct the setting, see "Influence of flow", page 110. If the red ***Delivery Low*** LED continues to flash: Observe the anesthetic gas measurements on the monitor. Set control dial to the ***0*** position. Disconnect the mains power supply. Remove the vaporizer from the anesthesia workstation if possible. Repair by specialized service personnel.
		Equipment fault	Observe the anesthetic gas measurements on the monitor.
		The tank is empty.	Refill with anesthetic agent, observe warm-up time if necessary.
Caution	Green ***Operational*** LED flashes. Yellow ***Battery*** LED flashes.	Mains power failure	Battery operation, vaporizer continues to dose, see "Operation during mains power failure (battery operation)", page 65. Prepare for change of anesthetic agent.
Note	Start and end of self-test are indicated by a short tone. All LEDs must light during the self-test.	If one or more LEDs do not light, there is a device fault.	Do not operate the vaporizer! Repair by specialized service personnel.
Note	Green ***Operational*** LED is lit.	Warm-up ended. The vaporizer is ready for use.	–
Note	When the control dial is moved from position ***0*** to a position ***>2***, a short tone must sound if the vaporizer is warmed up.	If this short tone does not sound, the acoustic transducer is defective.	Repair by specialized service personnel.

Priority	Alarm indication	Cause	Remedy
Note	Yellow ***Battery*** LED is lit.	Battery is not ready for the specified battery operation.	Connect vaporizer to the mains power supply without dosing (control dial to position ***0*** or ***T***). If the yellow ***Battery*** LED is still lit after 1 hour, the battery is defective. Have the battery replaced by service personnel, see page 38. Repair by specialized service personnel.
Note	Yellow ***Fill Up*** LED is lit.	The level is below the refill mark.	A full bottle of desflurane anesthetic agent can be added, see "Filling the Vaporizer", page 42.

Other faults

Fault	Cause	Remedy
No concentration delivered or concentration excessively high/low.	Vaporizer not full, vaporizer empty.	Fill the vaporizer.
	Control dial set to the position ***0*** or ***T***.	Set control dial to ≥***2*** Vol%.
	No vaporizer connected, or if several connections, one unoccupied and open.	Connect vaporizer, or close open connections with vaporizer or direct gas connections.
	Vaporizer filled with incorrect anesthetic agent or mixture of agents.	Drain the vaporizer, see page 69, and blow it off, see page 71. Have the vaporizer repaired by specialized service personnel.
	Gas is flowing through the vaporizer in the wrong direction.	Check the connection system, see page 39.
	Leak, e.g., plug-in adapter is not sitting completely on seals.	Disconnect vapor; check plug-in adapter safety locking device and sealing rings; replace. Perform tightness check of the vaporizer at control dial settings ***0*** and ≥***2*** Vol%.
	D-Vapor only Leakage at connector, e.g., vaporizer connected to Titus, which has not been converted for D-Vapor, see page 40.	Conversion by specialized service personnel.
	Valves in plug-in connector damaged.	Repair by specialized service personnel.
	Vaporizer being operated with carrier gas other than Air.	Concentration changes due to carrier gas, see page 57 and page 111.
	Vaporizer or anesthetic gas monitor faulty.	Use another vaporizer to check whether the vaporizer or the anesthetic gas monitor is faulty, repair by specialized service personnel.

Fault	Cause	Remedy
Anesthesia workstations equipped with a vaporizer detection system display anesthetic agent which is different from the vaporizer.	Coding for plug-in adapter or vaporizer is damaged, faulty, or incorrectly fitted.	Check coding, have it re-installed if required; repair by specialized service personnel.
Monitor displays different anesthetic agent than indicated on the vaporizer.	A different anesthetic agent has just been used. High concentrations of it are still present in the breathing system.	Flush breathing system or wait for gas to change.
	Incorrect anesthetic agent or anesthetic agent mixture in the vaporizer.	Check the vaporizer, drain and blow off, see page 69 and 71. Have the vaporizer repaired by specialized service personnel.
	Monitor has not yet switched over after a change of anesthetic agent.	Wait until the monitor switches over.
	Monitor defective.	Replace monitor.
Control dial cannot be set to concentration.	***0*** button not pressed.	Press the ***0*** button.
	Interlock not switched over. Interlock jamming or another vaporizer still switched on.	Switch off other vaporizer and switch over Interlock. Checks, see page 54 and 60. Repair by specialized service personnel.
The control dial can be moved from the positions ***0*** and ***T*** without the button being pressed. (12 % mark can be exceeded without pressing the button.)	***0*** button defective.	Repair by specialized service personnel.

Fault	Cause	Remedy
Smell of anesthetic agent, anesthetic agent vapor leakage, leakage too high during leakage test.	Plug-in adapter not fitted flush.	Check plug-in connector sealing rings and sealing surfaces; alternatively locking lever was twisted before connection.
	D-Vapor only Leakage at connector, e.g., vaporizer connected to Titus, which has not been converted for D-Vapor, see page 40.	Check that the power cable is not trapped between the vaporizer and the anesthesia workstation. Have the Titus main device converted by specialized service personnel.
	Seal on filling system defective.	Disconnect the vaporizer from the mains power supply. Repair by specialized service personnel.
	Anesthetic agent bottle withdrawn too quickly from the filling opening after the filling procedure.	Before removing the anesthetic agent bottle from the filling opening, wait until the anesthetic agent has drained into the tank. See "Ending the filling procedure" on page 45.
Filling level cannot be read in sight glass	Vaporizer completely empty.	Refill the vaporizer.
	Vaporizer overfilled.	Drain the vaporizer to the maximum marking. Check the concentration!
	Sight glass display faulty.	Repair by specialized service personnel.
Anesthetic agent in sight glass is discolored.	Vaporizer filled with incorrect agent.	Check and drain vaporizer, see page 69. Repair by specialized service personnel.
	Anesthetic agent discolored yellow due to interaction with the bottle.	Flush the tank with fresh desflurane in portions. If necessary, have the tank repaired by specialized service personnel.
Air in the tank.	Air in tank after long period of storage or during initial start-up. Concentration temporarily deviates downwards from the set value.	Refill anesthetic agent.

Filling and draining vaporizer

Fault	Cause	Remedy
Vaporizer accidentally filled with incorrect anesthetic agent.		Drain the vaporizer, see page 69, and blow it off, see page 71. Have the vaporizer repaired by specialized service personnel.
Anesthetic agent leaks from filling system.	Seal on anesthetic agent bottle damaged or defective.	Use another anesthetic agent bottle.

Plug-in adapter problems

Fault	Cause	Remedy
Locking lever does not engage in control dial when disconnected.	Control dial still set to ***0***.	Engage control dial in the ***T*** position.
Locking lever cannot be swung out of the control dial.	Control dial set to ***0*** or ≥***2*** Vol%. During a preceding transport, control dial may have been set to ***0*** or ≥***2*** Vol%.	Engage control dial in the ***T*** position.
Vaporizer cannot be disconnected.	Control dial not set to ***T***.	Engage control dial in the ***T*** position.
	Interlock still engaged.	Disengage Interlock.
	Locking lever cannot be swung back into control dial. Locking device between plug-in adapter and plug-in connector is jammed.	Remove locking cap on top of locking lever shaft. Loosen screw in the shaft with 3 mm Allen key screwdriver. The vaporizer can now be disconnected. Repair by specialized service personnel.
Plug-in adapter not fitting flush on plug-in connector seals. Leak in unit.	Locking lever not engaged in control dial, as it is set at ***0*** or ≥***2*** Vol%.	Set control dial to ***T*** and engage; insert pin on locking lever into slot on control dial and engage.
	Engagement mechanism on plug-in adapter or plug-in connector damaged.	Excessive force used may lead to jamming or problems when disconnecting. Repair by specialized service personnel.
	Locking lever was turned to the left before connection.	Remove vaporizer (control dial in position ***T***); engage locking lever in control dial; reconnect vaporizer.
	O-rings on plug-in adapter missing.	Fit O-rings.
	Extra O-ring on a pin on the plug-in connector or foreign body between plug-in connector and plug-in adapter.	Remove O-ring or foreign body.
	Cable trapped between vaporizer and anesthesia machine.	Correct the cable routing; observe the instructions for use for the anesthesia machine.

Fault	Cause	Remedy
Only D-Vapor Plug-in adapter only S-2000: Control dial cannot be turned.	Interlock pins are not in their original position.	If adjacent vaporizers have been removed: Check whether control dial can be turned. Squeeze both Interlock pins inwards by hand, one after the other, and release. If this does not correct the problem: Repair by specialized service personnel.

Problems with D-Vapor 3000 on the anesthesia workstation with the Vapor View option

Fault	Cause	Remedy
Lighting does not work.	Control dial in the ***T*** position or between the positions ***0*** and ***T***.	Engage the control dial in the ***0*** position.
	Anesthesia workstation not switched on.	Switch on anesthesia workstation.
	Viewing window at the vaporizer or anesthesia workstation dirty or covered with foreign bodies.	Clean viewing window, remove foreign bodies.
	Light source of camera system in the anesthesia workstation.	Contact specialized service personnel.
Lighting for the control dial does not work, but the lighting for the filling level works.	Window on the vaporizer for light to exit is dirty or covered with foreign objects.	Clean window for light to exit, remove foreign bodies.
Control dial position is not transferred or transferred incorrectly.	Viewing window partly covered in dirt.	Clean viewing window.
	Camera system in the anesthesia workstation defective.	Contact specialized service personnel.
Anesthetic agent type is not transferred.	Viewing window partly covered in dirt.	Clean viewing window.
	Camera system in the anesthesia workstation defective.	Contact specialized service personnel.
No alarm is generated by the anesthesia workstation when the refilling level has been reached.	Viewing window partly covered in dirt.	Clean viewing window.
	Camera system in the anesthesia workstation defective.	Contact specialized service personnel.
Vapor View function does not work.	Anesthesia workstation without Vapor View option.	Have the Vapor View option retrofitted to the anesthesia workstation by specialized service personnel.

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Cleaning and disinfection

Safety information for reprocessing

WARNING

Risk of infection, risk of injury or device faults

Validated reprocessing procedures must be used to reprocess the device and its accessories.

WARNING

Damage to the interior of the vaporizer can cause incorrect output concentration and may harm the patient.

If liquids other than the anesthetic agents specified get into the vaporizer, this can cause malfunctions of the vaporizer and harm to the patient.

Do not immerse the vaporizer in cleaning agents.

Detergents must not be allowed to get under the control dial.

Do not allow detergents to get into the gas inlets or gas outlets, or the filling system.

Do not sterilize the vaporizer.

Do not use solvents on the vaporizer.

WARNING

When handling units that are contaminated with bodily fluids, always follow the hospital hygiene regulations.

Reprocessing procedures

Classification of medical devices

For reprocessing, medical devices and their components are classified according to the type of application and the risk resulting from it:

– Non-critical medical devices: Surfaces accessible to the user, such as device surfaces, cables
– Semi-critical medical devices: Parts conducting breathing gas, e.g., breathing hoses, masks

With regard to reprocessing, this medical device is a non-critical medical device.

Testing of procedures and agents

The cleaning and disinfection of medical products has been tested with the following procedures and agents.

At the time of testing, the following agents exhibited good material compatibility:

– Buraton 10F made by Schülke & Mayr (basic active ingredient: aldehyde)
– Dismozon pur made by Bode Chemie (basic active ingredient: oxygen-releasing agent)

Manual disinfection and simultaneous cleaning

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

Class of active ingredient	Product name	Manufacturer
Chlorine-releasing agents	Actichlor® plus	Ecolab
	Klorsept® 17	Medentech
	BruTab 6S®	Brulin
Oxygen-releasing agents	Descogen® Liquid	Antiseptica
	Descogen® Liquid r.f.u.	
	Dismozon® plus	Bode Chemie
	Dismozon® pur	
	Oxycide®	Ecolab USA
	Perform®	Schülke & Mayr
	Virkon®	DuPont

Class of active ingredient	Product name	Manufacturer
Quaternary ammonium compounds	Mikrozid® sensitive liquid[1)]	Schülke & Mayr
	Mikrozid® sensitive wipes[1)]	
Aldehydes	Buraton® 10 F	Schülke & Mayr

1) Virucidal against enveloped viruses

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

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

The manufacturers of the surface disinfectants have verified at least the following spectra of activity:
– Bactericidal
– Yeasticidal
– Virucidal or virucidal against enveloped viruses

Observe the specifications of the surface disinfectant manufacturers.

Use surface disinfectants that are nationally authorized.

CAUTION

Damage to the vaporizer caused by solvents

Many materials react sensitively to certain organic solvents that are occasionally used for cleaning and disinfection (e.g., phenols, halogen-releasing compounds, strong organic acids, etc.).

If the vaporizer is exposed to such substances, damage can occur that is not always immediately apparent.

Performing manual cleaning including disinfection

- Remove dirt immediately with a wipe soaked in disinfectant.

WARNING

Danger to the patient, risk of damage to the equipment

Penetrating liquid may cause malfunction of or damage to the device, which may endanger the patient.

Only wipe-disinfect device surfaces and make sure no liquids penetrate into the device.

1 Carry out surface disinfection (scrub and wipe disinfection*).

2 After the contact time has elapsed, remove disinfectant residues.

Visual inspection

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

* Scrub and wipe disinfection means: The surface must be wiped moist under light pressure with an adequate quantity of disinfectant.

Before reusing on the patient

- Prepare the vaporizer, see page 37.
- Checking operational readiness, see page 54.

Service

Overview

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

WARNING

Risk of infection

To avoid the risk of infection, the vaporizer must be cleaned and disinfected in accordance with the hospital hygiene regulations before each maintenance operation. This also applies to vaporizers that are returned for repair.

WARNING

Risk of faulty components

Device malfunctions are possible due to wear or material fatigue of the components. To maintain the proper operation of all components, this device must undergo inspection at intervals specified by the manufacturer.

WARNING

Risk of patient injury

The patient is put at risk if maintenance is performed during ventilation.

Perform maintenance only when no patient is connected to the device.

Definition of service terms

Concept	Definition
Service	All measures (inspection, maintenance, repair) intended to maintain the functional condition of a medical device
Inspection	Measures intended to determine and assess the actual state of a medical device
Maintenance	Recurrent specified measures intended to maintain the functional condition of a medical device
Repair	Measures intended to restore the functional condition of a medical device after a device malfunction

Inspection

Regular inspections must be carried out and logged in accordance with the following requirements and at the stated intervals.

The inspections and safety checks are identical for D-Vapor and D-Vapor 3000.

Checks	Interval	Personnel responsible
Inspection and safety checks	Every 12 months	Service personnel

Safety checks

The safety checks do not replace the manufacturer-specified maintenance and its preventive replacement of wear parts.

WARNING

Risk of patient injury

Perform safety checks at the indicated intervals. Otherwise, the correct functioning of the medical device may be compromised.

1 Check accompanying documents:
- Associated instructions for use for the medical device present.

2 Check the medical device to see that the ready-to-use product is complete in accordance with the instructions for use.

3 Check the equipment combination for perfect condition:
- Markings are complete and legible
- No damage

4 Check function and safety:

- Checking operational readiness (see chapter "Operation" on page 54).
- Check of electrical safety according to IEC 62353 (device leakage current <50 µA) or IEC 60601 (normal condition NC* <50 µA, SFC** <100 µA)
- Check emergency power operation Battery charged for 1 hour; the vaporizer must dose for 5 minutes in battery operation at a flow rate of 4 L/min and control dial position 6 Vol%
- Check of leak tightness with vaporizer switched off and control dial positions ***0*** and ***18 Vol%***
  Test pressure: 350 hPa (357 cmH_2O),
  Test value: Leakage rate <3 mL/min relative to an ambient pressure of 1013 hPa (14.69 psi)
- Check of pneumatic resistance in control dial position ***0*** and ***2*** Vol%
  carrier gas: Air, flow: 10.0 L/min.

Control dial position	Test value
0	10 to 28 hPa (10.2 to 28.6 cmH_2O)
2	Pressure increase relative to control dial position ***0*** by 53 to 79 hPa (54 to 80.1 cmH_2O)

* NC: Normal Condition
** SFC: Single Fault Condition

5 Check of the filling level indication in the ***T*** control dial position:
Tilt the vaporizer forward and backward. The filling level indicated must fluctuate in the sight glass.

If any of the test points are not satisfied, the vaporizer must not be operated and must be repaired by specialized service personnel.

Maintenance

D-Vapor and D-Vapor 3000 do not need to undergo preventive maintenance and do not need to be regularly calibrated.

Repair

For all repairs, Dräger recommends DrägerService and only the use of authentic Dräger parts.

Wearing parts

The following wear parts must be replaced if any non-conformities with the specified values are found during inspection and servicing or during routine checks by the user.

Wear part	Personnel responsible	Note
Filter (gas inlet)	Specialized service personnel	
Mounting screw	Specialized service personnel	Replacement after unfastening the connection adapter from the vaporizer or unfastening the vaporizer from its permanent connection.
Locking pin (plug-in adapter)	Specialized service personnel	
O-ring (sealing plug)	Service personnel	– Remove the sealing plug. – Remove faulty O-ring. – Fit new O-ring.
Battery	Service personnel	see page 38

Disposal

Disposing of the medical device

WARNING

Risk of infection

Clean and disinfect the device and its parts before disposal!

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

This device is subject to EC Directive 2002/96/EC (WEEE). In order to comply with its registration according to this directive, this device may not be disposed of at municipal collection points for waste electrical and electronic equipment. Dräger has authorized a company to collect and dispose of this device. To initiate collection or for further information, visit Dräger on the Internet at www.draeger.com. Use the Search function with the keyword "WEEE" to find the relevant information. If access to Dräger's website is not possible, contact the local Dräger Organization.

At the end of its service life:

- Completely empty the vaporizer before disposal, see page 69.
- Blow off the vaporizer, see page 71
- Clean and disinfect the vaporizer, see page 89.
- Observe the applicable laws and regulations.

Battery disposal

WARNING

Risk of explosion! Do not throw batteries into fire.
Risk of chemical burns! Do not force batteries open.

The medical device battery contains pollutant substances.
The following applies for Germany: According to the Battery Ordinance, the end user is obliged to return batteries containing pollutant substances to the distributor or to a public waste disposal authority collection point. The battery contained in the device must therefore be removed by trained technical personnel before the disposal of the device. In other countries, observe the applicable laws and regulations for battery disposal.

Technical Data

Classifications

Classification according to EC Directive 93/42/EEC, Annex IX	Class II b
UMDNS-Code Universal Medical Device Nomenclature System – Nomenclature for medical products	10-144
Protection class according to IEC 60601-1	Class I
IP protection class	IPX1

Ambient conditions

During operation	
Temperature	18 to 30 °C (64.4 to 86 °F)
Atmospheric pressure	700 to 1100 hPa (10.2 to 16 psi)
Relative humidity	30 to 75 %, non-condensing
During storage and transport	
Temperature	–20 to 60 °C (–4 to 140 °F)
Atmospheric pressure	115 to 1100 hPa (1.7 to 16 psi)
Relative humidity	5 to 95 %, non-condensing

Performance characteristics

The D-Vapor is calibrated at a temperature of 22 °C (71.6 °F) and an atmospheric pressure of 1013 mbar (14.7 psi). Carrier gas: Air, flow: 2.5 L/min	
Concentration range	2 to 18 Vol%
Scale	
2 to 10 Vol%	1 Vol% divisions
10 to 18 Vol%	2 Vol% divisions
Flow range	0.2 to 15 L/min (STPD)
Direction of flow	According to arrow on rear of vaporizer
Required quality of the gases	Clean, medically pure mixtures of O_2 and Air or O_2 and N_2O
Oil content	<0.1 mg/m^3
Particle size	Dust-free air (filtered with pore size <1 µm)

Performance characteristics (Cont.)

Dew point	5 °C (41 °F) below ambient temperature When using CO_2 accessory equipment: Clean, medically pure mixtures of O_2 and CO_2 CO_2: Water content ≤2 mg/L at 500 kPa (72.52 psi)
Back pressure range opposing ambient atmospheric pressure at vaporizer outlet (e.g., due to machine components or O_2 flush)	At least –100 to 200 hPa (–102.2 to 203.9 cmH_2O)
Fluctuating pressure at vaporizer outlet due to ventilation, relative to pressure at vaporizer outlet without ventilation	–10 to 80 hPa (–10.2 to 81.7 cmH_2O)
Maximum fresh-gas inlet pressure	200 kPa (29 psi)
Accuracy of concentration delivered at vaporizer outlet at 22 °C (71.6 °F), 1013 hPa (14.69 psi) and 2.5 L/min Air with continuous flow, without ventilation pressure, without fluctuating pressure, and without back pressure.	
Vaporizers are calibrated by the manufacturer within the following tolerances under the previously noted calibration conditions.	±0.5 Vol% or ±15 % rel. The larger value applies.
Outside of the calibration conditions, the following applies:	
at 0.2 to 2 L/min fresh-gas flow	±0.9 Vol% or ±30 % rel. The larger value applies.
at 2 to 8 L/min fresh-gas flow	±0.9 Vol% or ±20 % rel. The larger value applies.
at 8 to 15 L/min fresh-gas flow	±0.9 Vol% or ±30 % rel. The larger value applies.
For fluctuating pressure, the requirements according to ISO 80601-2-13 apply outside of the calibration conditions.	
For metering during operation in Range B, see diagram **"Influence of flow" on page 110**	at least 1.2 L/min saturated vapor
Filling volume of anesthetic agent	
Total	300 mL
Between the minimum mark and the refill mark	40 mL
Below the refill mark	240 mL
Up to the minimum mark	20 mL
Loss of anesthetic agent to the surroundings per 24 hours at 22 °C (71.6 °F) in mL of liquid	
Vaporizer not operating	0.5 mL
Vaporizer operating	2.5 mL

Performance characteristics (Cont.)

Filling time for one anesthetic agent bottle of desflurane (240 mL)	
At 22 °C (71.6 °F) and with the vaporizer not yet warmed up	1 minute
At 22 °C (71.6 °F) and with a warmed-up vaporizer, the filling time is increased.	<2 minutes
Flow resistance at a fresh-gas flow of 10 L/min (STPD)	<100 hPa (102.2 cmH_2O)
Tilt angle	
During operation	10°
During storage and transport	No limit
Warm-up time at 22 °C (71.6 °F)	approx. 5 to 6 minutes (depending on the input voltage and the fill level of the vaporizer)
Bridging time when mains power supply absent	maximum of 5 minutes (at a concentration of 6 Vol% maximum, fresh-gas flow 4 L/min and fully charged battery)
Noise emission during operation	<45 dB (A)

Pneumatic interfaces

Filling systems	Baxter SAFE-FIL filling system for desflurane (Suprane)
	Piramal Fill filling system for desflurane (Torrane)
Connections	
D-Vapor	DW-2000, Auto Exclusion, Selectatec S-2000, permanent connection, ISO conical adapter
D-Vapor 3000	Auto Exclusion
Alternating fresh-gas flow	<30/min
Static pressure (above ambient pressure) at the interface	max. 200 kPa (2 bar)
Use of latex	D-Vapor and D-Vapor 3000 are not made with natural rubber latex.

Monitoring

Sound pressure $L_{(A)}$ of the alarm tones at the operator position: Fixed operator position: Front of the device at a distance of 1 m (39 inch) and a height of 1.5 m (59 inch). (In normal operation, the operator position is determined by visual contact with the sight glass and by operation of the control dial.) Free field measurement in accordance with ISO 3744.	
Sound pressure	at least 60 dB
Alarm tone sequence	
High priority alarms	Two tone sequences with 5 tones each, every 9 seconds: 
Medium priority alarms	One tone sequence with 3 tones, every 24 seconds: 
Signal for note	short tone

Electrical characteristics

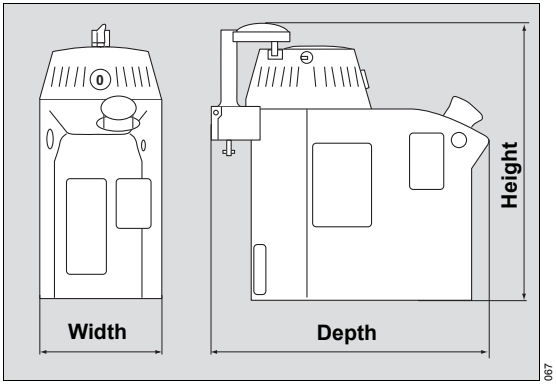
Supply voltage	100 V to 240 V
Supply frequency	50/60 Hz
Current consumption	2 A
Inrush current	25 A
Power consumption	
maximum	530 W during warm-up
typical	30 W
Fuse	2 x T2A L 250V/TR5 IEC 60127-3
Breaking capacity	35 A at 250 V DC (according to IEC 60129-3) 50 A at 250 V DC (according to UL)
Rechargeable battery	
Type	Nickel/metal hydride (NiMH)

Standards

Conformity with standards/directives When used in combination with other machines/medical devices, ensure the required conformity of the device combination.	ISO 80601-2-13 IEC 60601-1 IEC 60601-1-8
Electromagnetic compatibility	IEC 60601-1-2
Filling systems (Baxter SAFE-FIL filling system for desflurane [Suprane] and Piramal Fill filling system for desflurane [Torrane])	ISO 5360
23 mm conical connector (0.9 in conical connector)	ISO 5356-1

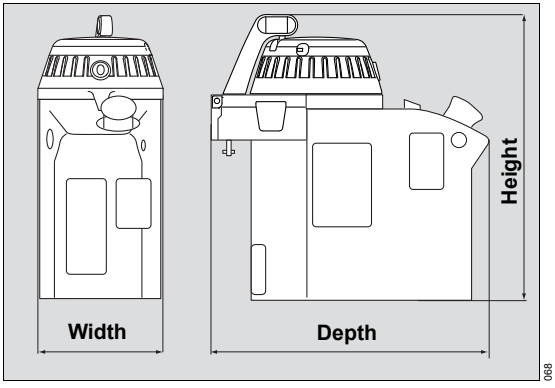
Dimensions

D-Vapor



Depth	248 mm (9.8 inch)
Width	110 mm (4.3 inch)
Height	248 mm (9.8 inch)

D-Vapor 3000



Depth	248 mm (9.8 inch)
Width	112 mm (4.4 inch)
Height	247 mm (9.7 inch)

Weight D-Vapor/D-Vapor 3000

Connector	Weight in kg (lbs)	
	Empty	Filled
Auto Exclusion or DW-2000	6.4 (14.1)	6.9 (15.2)
S-2000	6.2 (13.7)	6.7 (14.8)
ISO conical adapter	6.4 to 6.7 (14.1 to 14.8)	6.9 to 7.2 (15.2 to 15.9)
Permanent connection	5.8 (12.8)	6.3 (13.9)

EMC Declaration

General information

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

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

Electromagnetic environment

This device may only be used in environments specified in section "Environment of use" on page 16.

Emissions	Compliance
Radiated emissions	Class A, Group 1 (30 MHz to 1 GHz)
Conducted emissions	Class A, Group 1 (150 kHz to 30 MHz)

NOTE

The emissions characteristics of this device make it suitable for use in industrial areas and hospitals (CISPR 11 Class A). If it is used in a residential environment (for which CISPR 11 Class B is normally required), this device might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

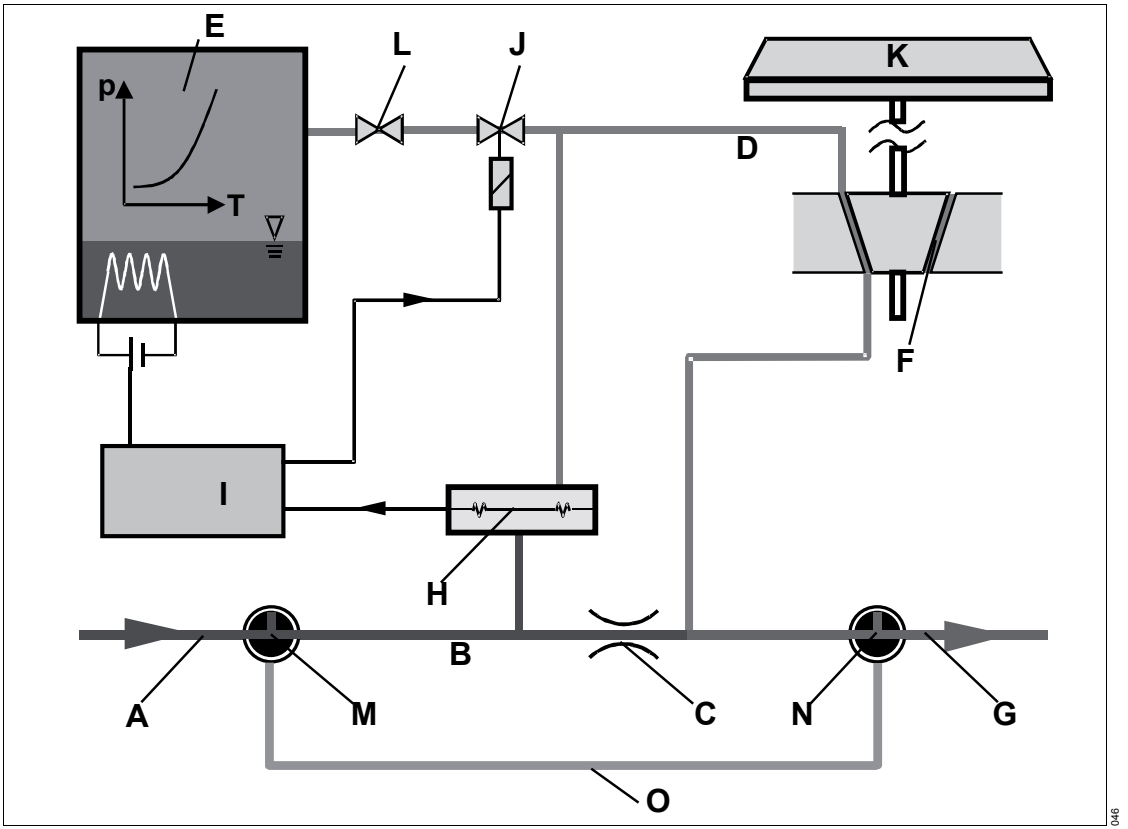
Immunity against	**Test level and required electromagnetic environment**
Electrostatic discharge (ESD) (IEC 61000-4-2)	Contact discharge: ±6 kV
	Air discharge: ±8 kV
Fast transient electrical disturbances (bursts) (IEC 61000-4-4)	Power cables: ±2 kV
	Longer signal input lines/output lines: ±1 kV
Impulse voltages (surges) (IEC 61000-4-5)	Voltage, external conductor – external conductor: ±1 kV
	Voltage, external conductor – protective ground conductor: ±2 kV
Magnetic fields at mains frequency (IEC 61000-4-8)	50 Hz: 3 A/m
Voltage dips and short interruptions in the supply voltage (IEC 61000-4-11)	Voltage dips of 30 % to 100 %, 8.3 ms to 5 s, different phase angles
Radiated high-frequency disturbances (IEC 61000-4-3)	80 MHz to 2.7 GHz: 3 V/m
Conducted high-frequency disturbances (IEC 61000-4-6)	150 kHz to 80 MHz: 3 V, ISM bands: 6 V
Electromagnetic fields in the vicinity of wireless communication devices	Various frequencies from 385 MHz to 5785 MHz: 9 V/m to 28 V/m

Recommended separation distances from wireless communication devices

To ensure that the functional integrity of this device is maintained, there must be a separation distance of at least 1.0 m (3.3 ft) between this device and radio communication devices.

Description

Function



Mixed gas (A) (carrier gas (B)) is passed via the fixed flow resistance of the bypass gap (C).

Desflurane vapor (saturated vapor (D)) flows from the heated tank (E) via the metering gap (F).

Carrier gas and saturated vapor combine and mix shortly ahead of the fresh-gas outlet (G).

With the aid of the differential pressure sensor (control sensor (H)), the controller (I) meters sufficient saturated vapor via the proportional valve (J) to ensure that the pressure drop across the two gaps (bypass and metering gap) is always equally large.

The desflurane concentration is determined by the ratio of the resistances of the fixed bypass gap and the metering gap. This ratio is set by the control dial (K).

The regulated tank heater provides a constant temperature (40 °C (104 °F)) and consequently a constant, adequate pressure (200 kPa (29 psi)) in the desflurane tank.

The shut-off valve (L) blocks the desflurane tank during the warm-up phase, when the control dial is in the ***0*** position or when a fault occurs (***No Output***).

Control dial position 0 or T – vaporizer switched off

The mixed gas flows from the vaporizer inlet via the branch (O) directly to the vaporizer outlet.

The interior of the vaporizer (bypass and metering gaps) is completely isolated from the gas flow by valves (M), (N). Anesthetic agent cannot get into the fresh gas.

A small hole in the valve (M) vents the interior of the vaporizer to the outside so that no pressure can build up. In the event of temperature and pressure fluctuations, small quantities of anesthetic agent vapor may escape.

Control dial setting ≥2 Vol% – vaporizer switched on

The fresh gas is routed through valves (M), (N), which are linked to the control dial (K), and through the bypass gap (C).

D-Vapor 3000

D-Vapor 3000 also has Vapor View functions. In conjunction with anesthesia workstations that also have the Vapor View option, the D-Vapor 3000 anesthetic vaporizer is illuminated in the area of the control dial and sight glass. Therefore, the concentrations set and the filling level are also visible in darkened rooms. Additionally, the position of the control dial is transmitted to the anesthesia workstation as a setting value.

Calibration

Each vaporizer is set individually for desflurane.

The calibration conditions are: 22 °C (71.6 °F) and 2.5 L/min Air with continuous flow without ventilation pressure.

The metering is checked with different flow rates at 22 °C (71.6 °F).

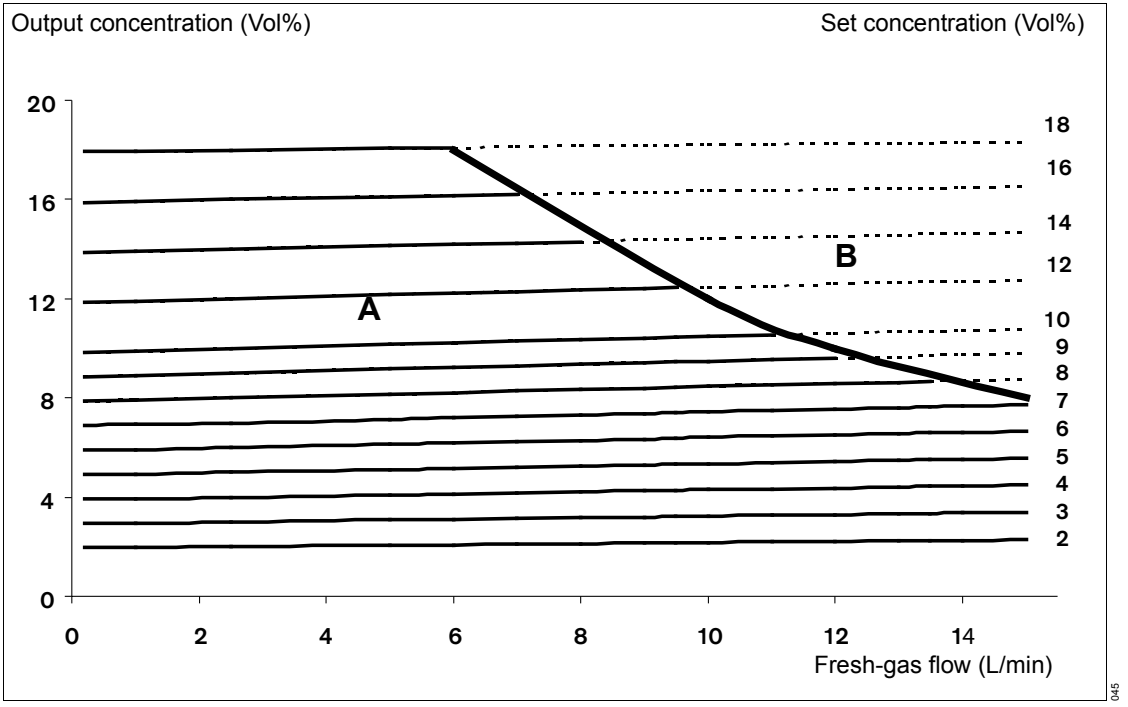
The calibration is carried out by measuring the metered concentration directly at the vaporizer outlet in Vol%.

The scale values on the control dial specify the concentrations for 22 °C (71.6 °F) and 1013 hPa (14.7 psi) at 2.5 L/min dry air.

Influence of temperature

The performance characteristics of the vaporizer are not significantly affected by temperature fluctuations within the specified operating range. See "Ambient conditions" on page 100.

Influence of flow



Within the specified flow range, the concentration delivered by the vaporizer is only slightly dependent on the fresh-gas flow.

In the area of the solid lines (A), the vaporizer meters with at least the required accuracy (see "Technical Data", page 101).

In the area of the dashed lines (B), with a simultaneously high flow rate and high concentration, the vaporizer meters less than the value set on the control dial. See "Technical Data", page 101.

The diagram shows the typical influence of flow on the concentration delivered at 22 °C (71.6 °F), 1013 hPa (14.69 psi) when operating with Air.

Influence of gas type and composition

The concentration delivered by the vaporizer is dependent on the composition of the fresh gas since the viscosity and density of the gas changes from one gas to another.

The vaporizer is calibrated with Air because the output concentration deviates little from the set value for the most frequently used anesthetic gas mixtures.

When operating with 100 % O_2 the output concentration with respect to Air rises by a maximum of 15 % relative.

When operating with 30 % O_2 and 70 % N_2O the output concentration with respect to Air falls by a maximum of 10 % relative.

Influence of atmospheric pressure and altitude

The D-Vapor is calibrated in Vol%. The calibration in Vol% is independent of the ambient pressure.

The partial pressure of the delivered desflurane vapor determines the physiological effect. The partial pressure is dependent on the ambient pressure. The required setting is calculated according to the formula:

$$\text{Required Setting} = \text{Desired partial pressure at 1013 hPa (14.69 psi)} \times \frac{\text{1013 hPa (14.69 psi)}}{\text{Atmospheric pressure hPa}}$$

The following table shows how the control dial on the vaporizer must be set at an altitude of 1000 m (3281 ft) and 2000 m (6562 ft) above sea level.

Normal setting of the control dial Vol%	Required setting of the control dial Vol%	
	Altitude 1000 m (3281 ft)	Altitude 2000 m (6562 ft)
5	5.5	6.5
10	11	12.5
14	16	18

Correction of the flow measurement under the influence of desflurane

Hot wire volume monitors, which are not compensated for desflurane, measure volumes that are too great when the desflurane concentration is high. See instructions for use for the monitor used.

Correcting values for the minute volume MV

$$MV_{corrected} = \text{Displayed MV} \times \frac{100 - 2 \times \text{desflurane concentration}}{100}$$

Correcting values for tidal volume VT

$$VT_{corrected} = \text{Displayed VT} \times \frac{100 - 2 \times \text{desflurane concentration}}{100}$$

Example:
– Desflurane concentration 8 Vol%
– Displayed minute volume MV 10 L/min

$$MV_{corrected} = 10 \times \frac{100 - 2 \times 8}{100}$$

$$MV_{corrected} = 10 \times 0.84$$

$$= 8.4 \text{ L/min}$$

List of accessories

Name and description	Part No.
D-Vapor	M35500
D-Vapor 3000	M36700
D-Vapor/D-Vapor 3000 Power cable, length 3 m (9.8 ft)	
CE	1856553
US	1856626
GB	1856596
CH	1856561
DK	1856588
Australia	1851810
Italy	1856618
ISR	1878840
TH/BR	1866915
BR	1875531
CN	1859706
Power cable (2 IEC plugs) / Extension	1856928
D-Vapor/D-Vapor 3000 Power cable (IEC-IEC), length 0.75 m (29.5 in)	1860925
Grounding cable, length 3.2 m (10.5 ft)	8301349
O-ring for plug-in system (2 pcs. required)	U04314
O-ring for sealing plug (Baxter SAFE-FIL filling system for desflurane [Suprane])	MK03818
O-ring for screw cap (Piramal Fill filling system for desflurane [Torrane])	M35964
Internal battery	M35526
Parking holder for wall rail for 2 vaporizers with DW-2000 or Auto Exclusion plug-in adapters	M26966
Technical documentation available on request	

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Quality Inspection Certificate

(Do not remove. Photocopy if necessary.)

Drägerwerk AG & Co. KGaA
Moislinger Allee 53-55
D-23542 Lübeck

is certified as a manufacturer of medical devices according to Annex II of Directive 93/42/EEC and maintains a Quality Management System conforming to the requirements of ISO 13485:2016 and ISO 9001:2015.

We hereby confirm to our client
(to be completed by the Drägerwerk AG & Co. KGaA distribution partner)

_____

_____

_____

that the product **D-Vapor/D-Vapor 3000**
with the Serial No.
(See rear of these Instructions for Use.
to be completed by the Drägerwerk AG & Co. KGaA distribution partner)

was manufactured and tested in Germany and conforms to the technical specifications.

The D-Vapor and D-Vapor 3000 anesthetic vaporizers are adjusted in the factory to within the tolerances specified in the following table under calibration conditions (temperature 22 °C (71.6 °F), atmospheric pressure 1013 hPa (14.69 psi), continuous flow 2.5 L/min Air without ventilation pressure, without pressure fluctuations and without back pressure). Precise measuring instruments are used for the individual adjustment to the desflurane anesthetic agent.

Control dial position [Vol%]	3.0	5.0	8.0	10.0	14.0	18.0
Tolerance [Vol%]	2.5 to 3.5	4.25 to 5.75	6.8 to 9.2	8.5 to 11.5	11.9 to 16.1	15.3 to 20.7

The control dial positions are set from low to high.

D-Vapor and D-Vapor 3000 anesthetic agent vaporizers bearing the CE mark fulfill the requirements of Annex I of Directive 93/42/EEC (medical products).

Drägerwerk AG & Co. KGaA
Vaporizer Production – Final Inspection

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These Instructions for Use only apply to **D-Vapor/D-Vapor 3000** with the Serial No.:
If no serial no. has been filled in by Dräger, these instructions for use are provided for general information only and are not intended for use with any specific device or unit.
These instructions for use will only be updated or exchanged on customer request.

CE 0123
Directive 93/42/EEC
concerning Medical Devices

Manufacturer

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Dräger reserves the right to make modifications to the device without prior notice.

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