Instructions for Use

Infinity Acute Care System

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

Babylog VN500
Ventilation Unit
SW 2.n

Typographical conventions

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

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

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

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

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

Any text shown on the screen and any labeling on the device are printed in bold and italics, for example, ***PEEP***, ***Air*** or ***Alarms***.

The "greater than" symbol **>** indicates the navigation path in a dialog window, for example, ***System setup*** > ***Ventilation*** > ***Modes***. In this example, ***System setup*** represents the dialog window title, ***Ventilation*** represents a horizontally aligned tab, and ***Modes*** a vertically aligned tab.

Screen images

Schematic renderings of screen images are used, which may differ in appearance or in configuration from the actual screen images.

Trademarks

– Infinity®

– Babylog®

– QuickSet®

– ATC®

– Acute Care System™

– Medical Cockpit™

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– Sekusept®

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Safety information definitions

WARNING

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

CAUTION

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

NOTE

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

Definition of target groups

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

These traget groups have been instructed in the use of the medical device and have the necessary knowledge to use, install, reprocess, maintain or repair the medical device.

Dräger emphasizes that the medical device must be used, installed, reprocessed, maintained or repaired exclusively by defined target groups.

Users

Users are persons who may use the medical device in accordance with its intended use.

Service personnel

Service personnel are persons who are responsible for the maintenance of the medical device towards the operating organization.

Service personnel are persons who may install, reprocess, or maintain the medical device.

Experts

Experts are persons who may carry out repair or complex maintenance work on the medical device.

Abbreviations and symbols

For explanations, refer to the 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 device.

Strictly follow these Instructions for Use

WARNING

Any use of the medical device requires full understanding and strict observation of all sections of these Instructions for Use. The medical device must only be used for the purpose specified under "Intended use" on page 16 and in conjunction with appropriate patient monitoring (see page 10). Strictly observe all WARNING and CAUTION statements throughout these Instructions for Use and all statements on medical device labels. Failure to observe these safety information statements constitutes a use of the medical device that is inconsistent with its intended use.

Maintenance

WARNING

The medical device must be inspected and serviced regularly by service personnel. Repair or complex maintenance work carried out on the medical device must be performed by experts.
Dräger recommends that a service contract is obtained with DrägerService and that all repairs are performed by DrägerService. Dräger further recommends that only authentic Dräger repair parts are used for maintenance.
If the above are not complied with, the correct functioning of the medical device may be compromised.
See chapter "Maintenance".

Safety checks

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

Accessories

WARNING

Only the accessories indicated on the list of accessories 9052284 (2nd edition or higher) have been tested and approved for use with the medical device.
Therefore, it is strongly recommended that only these accessories are used in conjunction with the medical device. Otherwise, the correct functioning of the medical device may be compromised.

Not for use in areas of explosion hazard

WARNING

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

Restriction of distribution

CAUTION

This medical device is intended for use in health care facilities only and exclusively by persons with specific training and experience in its use.

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.

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 any combination of devices, refer to and strictly comply with the Instructions for Use for all connected devices and device combinations.

Connection to other devices

Device combinations approved by Dräger (see Instructions for Use of the individual devices) meet the requirements of the following standards:

– IEC 60601-1 (2nd Edition)
Medical electrical equipment
Part 1: General requirements for safety

  – IEC 60601-1-1
  Medical electrical equipment
  Part 1-1: General requirements for safety
  Collateral standard: Safety requirements for medical electrical systems

  – IEC 60601-1-2
  Medical electrical equipment
  Part 1-2: General requirements for safety
  Collateral standard: Electromagnetic compatibility; Requirements and tests

  – IEC 60601-1-4 (EN 60601-1-4)
  Medical electrical equipment
  Part 1-4: General requirements for safety
  Collateral standard: Programmable electrical medical systems

  – IEC 60601-1-8
  Medical electrical equipment
  Part 1-8: General requirements for safety, including essential performance characteristics
  Collateral standard: General requirements, tests and guidelines for alarm systems in medical electrical equipment and in medical electrical systems

If Dräger devices are connected to other Dräger devices or third-party devices and the resulting combination is not approved by Dräger, the correct functioning of the devices may be compromised. The owner is responsible for ensuring that the resulting system meets the requirements of the applicable standards.

Strictly observe Assembly Instructions and Instructions for Use for each networked device.

Connection to IT network

The connection of the medical device to a network or later changes in the network can result in previously unidentified risks for patients, users and third parties. These risks must be identified and controlled before putting the medical device into operation.
Relevant changes to the network include:
– Configuration changes
– Adding or removing additional equipment
– Updating or upgrading connected equipment

Risks

Overloading of the medical device as a result of very high network traffic (e.g. due to "denial of service" attacks) could lead to deactivation of the interfaces. The service functionality would not then be available until the medical device has been restarted. In very rare cases a warm start, possibly repeated, can occur.

Patient safety

The design of the medical device, the accompanying documentation, and the labeling on the medical device are based on the assumption that the purchase and the use of the medical device are restricted to users, and that certain inherent characteristics of the medical device are known to the users. Instructions and WARNING and CAUTION statements are therefore largely limited to the specifics of the Dräger medical device. These Instructions for Use do not contain references to various hazards which are obvious to users or references to the consequences of medical device misuse, or to potentially adverse effects in patients with different underlying diseases. Medical device modification or misuse can be dangerous.

CAUTION
Risk of patient injury
Do not make therapeutic decisions based solely on individual measured values and monitoring parameters.

Patient monitoring

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

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

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

Information on Electromagnetic Compatibility

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

Electromedical devices are subject to special precautionary measures concerning electromagnetic compatibility (EMC) and must be installed and put into operation in accordance with the EMC information provided in the separate Instructions for Use "Workstation Critical Care and Workstation Neonatal Care".

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

WARNING

Do not connect connectors with an ESD warning symbol and do not touch the pins of such connectors without implementing ESD protective measures. Such protective measures may include antistatic clothing and shoes, touching a ground stud before and during connection of the pins, or using electrically insulating and antistatic gloves. All relevant personnel must be instructed in these ESD protective measures.

WARNING

Do not use portable and mobile HF communications equipment, e.g., mobile phones, in the vicinity of the medical device. Maintain separation distances; see EMC information in the separate Instructions for Use, "Workstation Critical Care and Workstation Neonatal Care".

Sterile accessories

CAUTION

Do not use sterile-packaged accessories if the packaging has been opened, is damaged or there are other signs of non-sterility. Disposable articles must not be reprocessed and resterilized.

Reuse, reprocessing, or sterilization of disposable articles can lead to a failure of the medical device and cause injuries to the patient.

Installing accessories

CAUTION

Install accessories to the basic device in accordance with the Instructions for Use of the basic device. Make sure that there is a safe connection to the basic device system.

Strictly observe Assembly Instructions and Instructions for Use.

Keeping the Instructions for Use

CAUTION

The Instructions for Use must be kept in an accessible location for users.

Product-specific safety information

WARNING

This medical device is intended to be used only by trained users.

WARNING

Medications and other substances based on flammable solvents, such as alcohol, must not be used in the patient system. Risk of fire Sufficient ventilation must be ensured if highly flammable substances are used for disinfection.

WARNING

Risk of fire
Do not use the medical device in conjunction with flammable gases or flammable solutions that can mix with air, oxygen or nitrous oxide, or other sources of ignition since the medical device could ignite. Do not allow the medical device to come into contact with sources of ignition.

WARNING

Do not use the medical device during magnetic resonance imaging (MRI, NMR, NMI)! This may impair correct functioning of the medical device and endanger the patient.

WARNING

Do not use the medical device in hyperbaric chambers! This may impair correct functioning of the medical device and endanger the patient.

WARNING

Correct functioning of the medical device may be impaired by operation of high-frequency electrosurgery units, defibrillators or short-wave therapy equipment and endanger the patient.

WARNING

Unauthorized modifications to the medical device lead to malfunction. This medical device may not be modified without permission from its manufacturer.

WARNING

Risk of fire
Do not use the medical device in oxygen-enriched rooms since the medical device could ignite.
Medical device malfunctions can increase the O_2 concentration in the ambient air. The medical device is only suitable for use in rooms with sufficient ventilation.

WARNING

Do not obstruct the gas inlet for the safety valve. Otherwise, spontaneous breathing via the emergency breathing valve is not possible in the event of a device failure.

WARNING

To maintain grounding integrity, connect only to a "hospital grade" receptacle. Always disconnect supply before servicing.

WARNING

With neonates, the administration of increased O_2 concentrations can lead to retinopathy of prematurity.
Use additional monitoring, e.g., external SpO_2.

WARNING

Risk of unnoticed change in FiO_2

An additional flow delivered by an external flow source can change the actual O_2 concentration administered.

WARNING

If a device for nitric oxide (NO) delivery without internal NO monitoring is used, the NO concentration must be monitored separately.

CAUTION

Keep away from sources of heat such as direct sunlight, heat radiators or spotlights! Otherwise the medical device may become too hot.

CAUTION

Do not obstruct or close off the vents on the medical device. Air must be able to enter freely. Otherwise the medical device may become too hot. An alarm is triggered if the medical device overheats during operation.

CAUTION

Positive-pressure ventilation can lead to negative effects, such as barotrauma or strain on the circulatory system.

CAUTION

An additional flow delivered by an external flow source can impair the measured values for airway pressure and flow.

Functional safety of Babylog VN500

The essential performance consists in a controlled and monitored patient ventilation with user-defined settings for the monitoring functions
– minimum breathing gas flow,
– maximum airway pressure,
– minimum and maximum O_2 concentration in the breathing gas,

or, if a set limit is exceeded, an appropriate alarm. The medical device is equipped with basic safety features to reduce the possibility of patient injury while the cause of an alarm is remedied.

Functional safety of GS500

The gas supply unit GS500 has no essential performance characteristics according to IEC 60601-1.

Monitoring ventilation

The following parameters are monitored by the built-in monitoring facilities of Babylog VN500:
– Airway pressure
– Expiratory minute volume
– Respiratory rate
– Apnea alarm time
– Inspiratory O_2 concentration
– End-expiratory CO_2 concentration

Changes in these parameters may be caused by:
– Acute changes in the patient's condition
– Incorrect settings and faulty handling
– Device malfunctions
– Failure of power and gas supplies

If a fault occurs in this equipment, separate measuring instruments must be used.

During O_2 therapy, the monitoring functions of the medical device are limited. See chapter "O_2 therapy" on page 99.

Back-up ventilation with an independent manual ventilation device

WARNING

If a fault is detected in the medical device, its life-support functions may no longer be assured. Ventilation of a patient using an independent ventilation device must be started without delay, if necessary with PEEP and/or an increased inspiratory O_2 concentration.

Handling Infinity ID components

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

WARNING
Risk of patient injury

Although Babylog VN500 does not exceed the valid limit values for electromagnetic fields, radiation can interfere with the functioning of pacemakers. Wearers of pacemakers must keep a distance of at least 25 cm (10 in) between the pacemaker and Babylog VN500.

Emission of high-frequency energy

This medical device is equipped with an RFID (Radio Frequency Identification) system to enable wireless communication with Infinity ID accessories. Any changes or modifications to the RFID system may only be carried out by trained service personnel. Otherwise this may compromise patient safety.

This medical device has been designed and manufactured to comply with emission limit values for high-frequency energy. These limiting values are incorporated in international safety standards such as IEC 60601-1-2 (EN 60601-1-2) which have been defined by regulation authorities, such as the Federal Communications Commission (FCC Rules), Industry Canada (Radio Standards Specifications) and the European Telecommunications Standards Institute (ETSI standards).

The RFID system of this medical device complies with Part 15 of the FCC regulations, and its operation is subject to the following conditions:

1. This medical device does not cause any dangerous interference.
2. The medical device is not liable to damage caused by the reception of interference, including interference causing undesired operating conditions.

Dräger hereby declares that the RFID system in the ventilation unit is in compliance with the basic requirements and the other pertinent regulations of Directive 1999/5/EC.

Application

Intended use

The Babylog VN500 ventilation unit of the Infinity Acute Care System is intended for the ventilation of neonatal patients from 0.4 kg (0.88 lbs) up to 10 kg (22 lbs) and pediatric patients from 5 kg (11 lbs) up to 20 kg (44 lbs) bodyweight. Babylog VN500 offers mandatory ventilation modes and ventilation modes for spontaneous breathing support and airway monitoring. The Babylog VN500 ventilation unit is used with Infinity C Series Dräger Medical Cockpits. The Babylog VN500 ventilation unit is intended for use in different medical care areas.

Indications for use and contraindications

Indications

The Babylog VN500 ventilation unit is used in combination with Dräger Infinity C Series Medical Cockpits. Babylog VN500 is used for treating patients who require temporary or longer term respiratory support for different medical reasons.

Contraindications

There are no additional contraindications apart from the contraindications contained in chapter "For your safety and that of your patients".

It is the responsibility of the user to select the appropriate respiratory mode for the underlying disease of the patient. For all ventilator settings, the user needs to consider the respiratory status and the general state of health of the patient in order to optimally adapt the ventilation settings to the patient's condition. Any changes to the patient's state need to be monitored continuously.

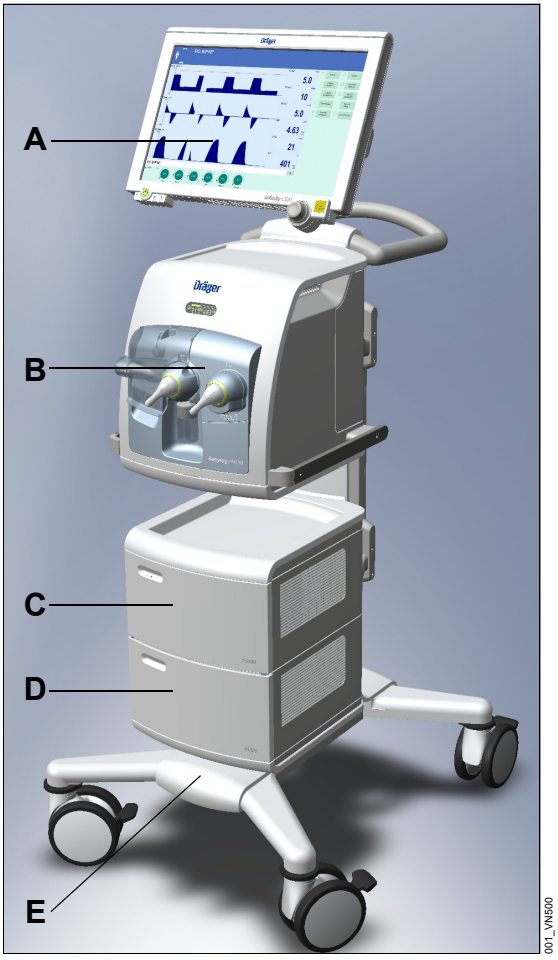
Environment of use

Babylog VN500 is intended for stationary use in hospitals and medical rooms or for patient transportation within the hospital.

Babylog VN500 must not be used:
- In hyperbaric chambers
- For magnetic resonance imaging (MRI, NMR, NMI)
- In conjunction with flammable gases or flammable solutions that can mix with air, oxygen or nitrous oxide
- In areas of explosion hazard
- In areas with combustible or explosive substances
- In rooms without sufficient ventilation

System overview

Infinity Acute Care System – Workstation Neonatal Care



A Infinity C500 – Control and display unit (Medical Cockpit). Strictly follow the Instructions for Use for "Infinity Medical Cockpits".

B Babylog VN500 – Ventilation unit

C GS500 – Gas supply unit

D PS500 – Power supply unit

E Trolley 2 - 90 cm – Trolley

How to use the Workstation Neonatal Care

The Workstation Neonatal Care can consist of the following units:
- Infinity C500 (Medical Cockpit)
- Babylog VN500 (ventilation unit)
- Trolley 2 - 90 cm (trolley)
- GS500 (gas supply unit)
- PS500 (power supply unit)
- Transport Supply Unit (transport supply unit)

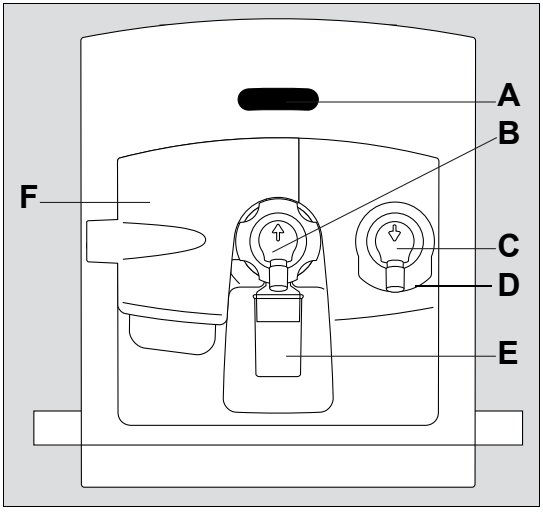
Before using the Workstation Neonatal Care, carefully read the following Instructions for Use:
- Instructions for Use for "Workstation Critical Care and Workstation Neonatal Care"
- Instructions for Use for "Infinity Medical Cockpits"
- Instructions for Use for "Babylog VN500"
- Instructions for Use for "Transport Supply Unit"

The Workstation Neonatal Care may include additional accessories, see separate list of accessories.

Babylog VN500

Front view

Front view, flap closed



A Operation display for ventilation

During ventilation, the inspiratory and expiratory phases are indicated by a bar display. The measured values for minute volume ***MVe*** and the inspiratory O_2 concentration ***FiO2*** are also displayed.

B Infinity ID neonatal expiratory valve with expiratory port ***Exp.*** (GAS RETURN)

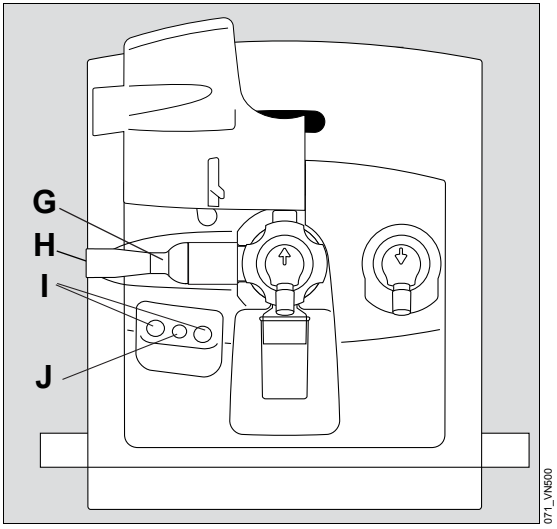
C Inspiratory unit (safety valve with inspiratory port) ***Insp.*** (GAS OUTPUT)

D Gas inlet for the safety valve ***Emergency air intake***, non-tapered connection, do not obstruct (EMERGENCY AIR INTAKE)

E Water trap

F Flap

Front view, flap folded upwards



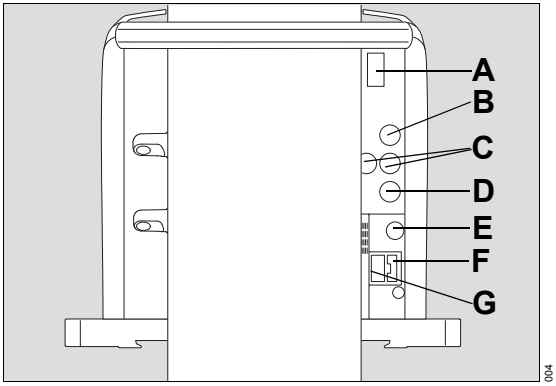
G Muffler

H Gas outlet ***Exhaust***, non-tapered connection (EXHAUST – NOT FOR SPIROMETER)

I Connections for future extensions

J Nebulizer port (nebulizer gas outlet for pneumatic medication nebulizer)

Rear view



A Fuse for the batteries

B Connection for the neonatal flow sensor ***V5*** 

C Connections for future extensions ***V6, V8***

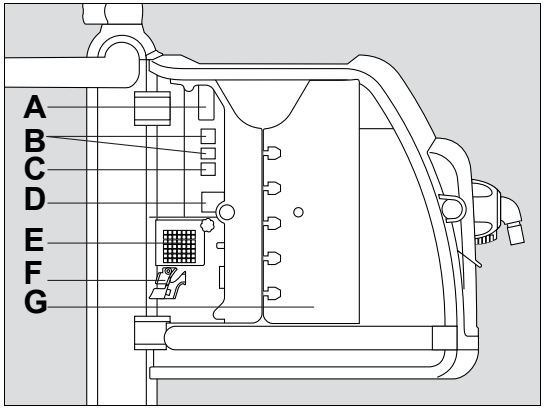
D Connection for CO_2 sensor ***V7*** 

E Potential equalization pin

F Fuse for mains power supply ***F1***, ***F2***

G Connection for mains power supply

Left side view



A Connection for system cable to Infinity C500 ***V1***

B Connections for future extensions ***V2***, ***V3***

C Connection for nurse call ***V4***

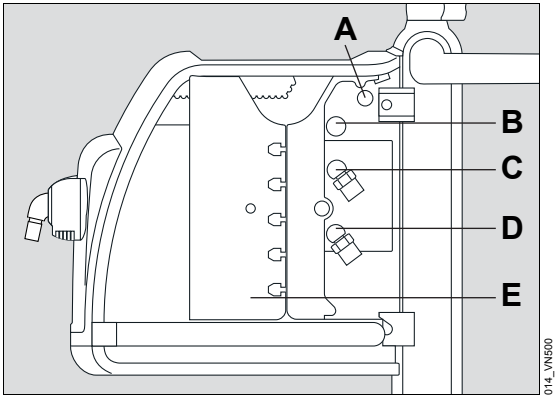
D Toggle switch 

E Ambient air filter with cover

F Strain relief for cable

G Left device flap

Right side view



A Connection for data cable to the gas supply unit GS500 ***V9***

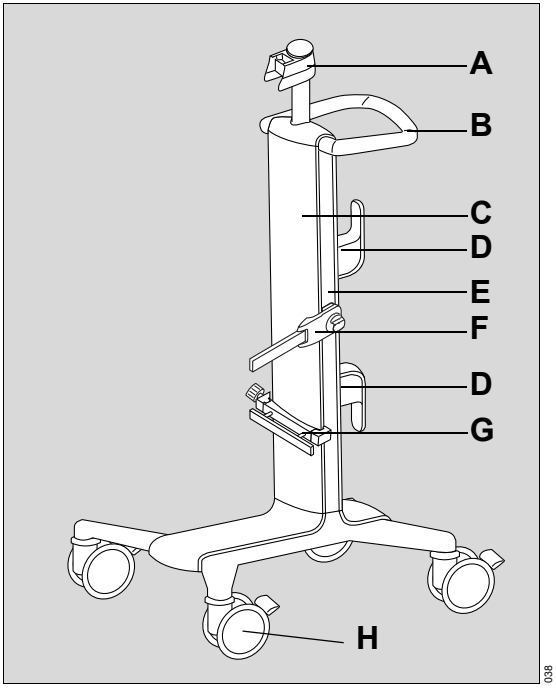
B Connection for gas connection to the gas supply unit GS500

C Connection for Air compressed gas hose ***Air*** (FRESH GAS)

D Connection for O_2 compressed gas hose ***O_2*** (FRESH GAS)

E Right device flap

Trolley 2 - 90 cm



A Holder for Infinity C500

B Handle

C Trolley column

D Hose hooks

E Alignment aid

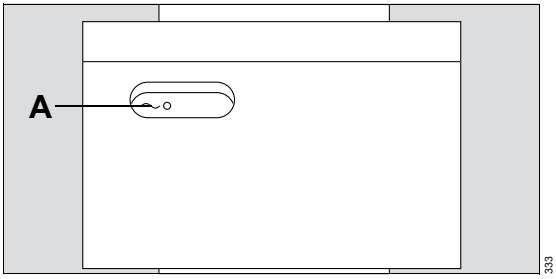
F Humidifier holder, can be swiveled

G Universal holder with standard rail

H Double castors with locking brake, set of 4

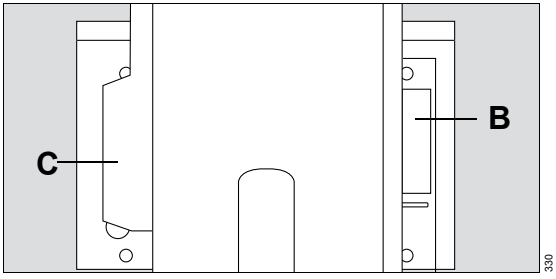
Gas supply unit GS500

Front view



A LED ~ for display of mains power supply (if separate mains plug is available)

Rear view



B Rating plate

C Gas connection

Range of functions

The functions described correspond to the overall functionality of Babylog VN500. Some functions are only optional and may not be included in the individual device configuration. Optional functions are shown in the separate list of accessories.

Ventilation functions of Babylog VN500

Ventilation modes:
- Pressure-controlled ventilation:
  - PC-SIMV
  - PC-AC
  - PC-CMV
  - PC-APRV
  - PC-PSV
  - PC-MMV
- Support of spontaneous breathing:
  - SPN-CPAP/PS
  - SPN-CPAP/VS
  - SPN-PPS

Additional settings for ventilation:
- Apnea Ventilation
- Flow trigger
- Sigh
- Volume Guarantee
- ATC
- AutoRelease

Special maneuvers:
- Suction maneuver
- Manual inspiration/hold
- Medication nebulization

Therapy types:
- Invasive ventilation (Tube)
- O_2 Therapy
- Non-invasive ventilation (NIV)

Additional information

For a detailed description of the ventilation modes and the additional settings see page 244.
Abbreviations see page 25.

Monitoring functions

Patient monitoring is supported by the following alarm limit settings:
- Maximum airway pressure Paw
- Expiratory minute volume MVe
- Apnea alarm time Tapn
- Respiratory rate RR
- End-expiratory CO_2 concentration etCO_2

The inspiratory O_2 concentration is monitored by automatically set limits.

Babylog VN500 offers the following displays:
- Curves
- Graphic trends
- Numeric trends
- Loops
- Alarm history
- Logbook
- Numeric parameters
- Preconfigured lists for measured values and set values
- Customized lists for measured values and set values
- Smart Pulmonary View

During non-invasive ventilation and O_2 therapy, certain monitoring functions are switched off or can be switched off.

Connections for the breathing hoses

For connection of the breathing hoses, the standard IEC 60601-2-12 stipulates conical inspiratory ports and expiratory ports as per ISO 5356-1 with a diameter of 15 mm (0.59 in) or 22 mm (0.87 in). Babylog VN500 has, like Babylog 8000, conical inspiratory ports and expiratory ports with a diameter of 11 mm (0.43 in).

Electrical power supply

Babylog VN500 is designed for connection to the hospital's mains power supply with 100 to 240 V at 50/60 Hz.

If mains power fails, operation is maintained either via the internal battery of Babylog VN500 or via the power supply unit PS500.

Gas supply

Babylog VN500 features country-specific connections for the gas supply with oxygen and medical compressed air.

The Workstation Neonatal Care may be equipped with the external gas supply unit GS500. GS500 supplies Babylog VN500 with compressed air.

Data transfer

A variety of interfaces can be used for transferring data:
- USB port for data export and configuration exchange using a USB storage medium
- USB port for installation of optional applications via a SIM card reader and a SIM card
- RS 232 port on Infinity C500 for data transfer using the MEDIBUS or the MEDIBUS.X protocol

Medication nebulizer

For medication nebulization a pneumatic low flow medication nebulizer can be connected.

Connecting accessories

A humidifier and other approved accessories can be connected to the lateral rails of Babylog VN500. In so doing, it must be ensured that the maximum weight of 4 kg (8.8 lbs) does not exceed a maximum distance of 10 cm (3.9 in).

For hose holders connected to the lateral rails of Babylog VN500, the maximum weight of 1 kg (2.2 lbs) must not exceed a maximum distance of 100 cm (39.4 in).

The accessories can also be connected to the holders provided on the trolley.

Abbreviations

Abbreviation	Explanation
% leak	Leakage in percent
%MVspon	Spontaneous breathing portion of minute volume in percent
%PEF	Percentage of the peak expiratory flow
%PIF	Percentage of the peak inspiratory flow
Air	Connection for Air compressed gas hose (FRESH GAS)
ALARM RESET	Acknowledging an alarm message that is no longer active ("Reset")
Apnea Vent.	Apnea ventilation
APRV	Airway Pressure Release Ventilation
ATC	Automatic Tube Compensation, compensation of the tube resistance
BF	Insulation class Body Floating
BTPS	Body Temperature Pressure Saturated, measured values based on the condition of the patient's lungs, body temperature 37 °C (98.6 °F), water vapor-saturated gas, atmospheric pressure
C	Compliance
C20/Cdyn	Index of the last 20 % of compliance in relation to the dynamic total compliance
Cdyn	Dynamic compliance
cmH_2O	Measuring unit for pressure 1 cmH_2O = approx. 1 mbar
Compens.	Degree of tube compensation
COPD	Chronic Obstructive Pulmonary Disease
Cycles sigh	Number of cycles during a sigh phase (set value)
DHCP	Dynamic Host Configuration Protocol
ΔintPEEP	Additional intermittent PEEP for sigh (set value)
ΔPsupp	Pressure support relative (above PEEP) (set value)
E	Elastance
EIP	End Inspiratory Pressure
EMC	Electromagnetic compatibility
Emergency air intake	Safety air inlet, inspiratory relief valve (EMERGENCY AIR INTAKE)
ESD	Electrostatic Discharge
ET	Endotracheal tube
etCO_2	End-expiratory CO_2 concentration
ETSI	European Telecommunications Standards Institute
Exhaust	Gas outlet (EXHAUST – NOT FOR SPIROMETER)
Exp.	Label on the device, Expiratory port (GAS RETURN)
Exp.	Expiration
Exp. term.	Termination criterion in % from the peak expiratory flow
FCC	Federal Communications Commission, regulatory authority for communications devices in the U.S.
FiO_2	Inspiratory O_2 concentration (set value)
Flow	Flow (set value)
Flow Assist	Flow support in SPN-PPS (set value)
Flow trigger	Trigger threshold, sensitivity (set value)
FRC	Functional Residual Capacity

Abbreviation	Explanation
GS500	Gas supply unit
HME	Heat Moisture Exchanger
hPa	Hectopascal, measuring unit for pressure 1 hPa = 1 mbar = approx. 1 cmH_2O
HF	High frequency
I:E	Ratio of inspiratory time to expiratory time (set value)
I:Espon	I:E during spontaneous breathing
IEC/CEI	Alarm tone as per IEC 60601-1-8
Insp.	Label on the device, Inspiratory port (GAS OUTPUT)
Insp.	Inspiration
Insp. flow	Inspiratory flow
Interval sigh	Time between two sigh phases (set value)
LAN	Local Area Network
mbar	Millibar, measuring unit for pressure 1 mbar = approx. 1 cmH_2O
MEDIBUS	Dräger communication protocol for medical devices
MEDIBUS.X	Dräger communication protocol for medical devices with a data definition which is standardized across all devices
mmHg	Measuring unit for end-expiratory CO_2-concentration
More...	Show more alarms
MRI	Magnetic resonance imaging
MV	Leakage-corrected minute volume
MV delay	Duration of alarm suppression for ***MV high*** and ***MV low***
MV high	Upper alarm limit for minute volume
MV low	Lower alarm limit for minute volume

Abbreviation	Explanation
MVapn	Minute volume during apnea ventilation
MVe	Expiratory minute volume, overall, not leakage-corrected
MVemand	Mandatory expiratory minute volume
MVespon	Spontaneous expiratory minute volume
MVi	Inspiratory minute volume, overall, not leakage-corrected
MVleak	Leakage minute volume
Neo.	Neonates patient category
NIV	Non-Invasive Ventilation
NMI	Nuclear magnetic imaging
NMR	Nuclear magnetic resonance
NO	Nitric oxide
NTPD	Normal Temperature Pressure Dry, 20 °C (68 °F), 1013 hPa, dry
O_2	Connection for O_2 compressed gas hose (FRESH GAS)
O_2 suction	Suction maneuver
Palv	Alveolar pressure
Paw	Airway pressure
Paw high	Upper alarm limit for airway pressure
PC-AC	Pressure Control-Assist Control, assisted-controlled, pressure-controlled ventilation with back-up respiratory rate
PC-APRV	Pressure Control-Airway Pressure Release Ventilation, spontaneous breathing under continuous positive airway pressure with brief pressure releases
PC-CMV	Pressure Control-Continuous Mandatory Ventilation, continuous pressure-controlled ventilation

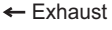
Abbreviation	Explanation
PC-MMV	Pressure Control-Mandatory Minute Volume Ventilation, pressure-controlled ventilation to ensure a mandatory volume per minute
PC-PSV	Pressure Control-Pressure Support Ventilation, spontaneous breathing at continuous positive pressure level with pressure support and back-up respiratory rate
PC-SIMV	Pressure Control-Synchronized Intermittent Mandatory Ventilation, intermittent, triggered, pressure-controlled ventilation
Ped. pat.	Pediatric patient category
PEEP	Positive end-expiratory pressure
Phigh	Upper pressure level in APRV (set value)
Pinsp	Inspiratory pressure (set value)
PIP	Peak Inspiratory Pressure
Plow	Lower pressure level in APRV (set value)
PmanInsp	Pressure of the breath for manual inspiration during NIV (patient category ***Neo.***, ventilation mode SPN-CPAP)
Pmax	Maximum allowed airway pressure (set value)
Pmax/Paw high autoset	Linking the maximum airway pressure to the alarm limit Paw high
Pmean	Mean airway pressure
Pmin	Minimum airway pressure
Pplat	Airway pressure on the plateau
PS	Pressure Support
PS500	Power supply unit
Psupp	Pressure support absolute
Ptrach	Pressure in the trachea
R	Total resistance
r^2	Correlation coefficient for the calculation method "Least Mean Square" for R, C and TC
REF	Material and revision number of the medical device
RFID	Radio Frequency Identification
Rpat	Patient resistance, patient airway resistance
RR	Respiratory rate (set value)
RR high	Upper alarm limit for respiratory rate
RRapn	Respiratory rate of apnea ventilation (set value)
RRmand	Mandatory portion of respiratory rate
RRspon	Spontaneous breathing portion of respiratory rate
RRtrig	Portion of mandatory triggered breaths
RSB	Rapid Shallow Breathing, quotient of spontaneous respiratory rate and tidal volume
SIM	Subscriber Identity Module, participant identification
Slope	Pressure rise time (set value)
Smart Pulmonary View	Graphic display of lung characteristics (Lung display)
SN	Device serial number
SPN-CPAP	Spontaneous-Continuous Positive Airway Pressure, spontaneous breathing with continuous positive pressure level
SPN-CPAP/PS	Spontaneous-Continuous Positive Airway Pressure/Pressure Support, spontaneous breathing with continuous positive pressure level with or without pressure support

Abbreviation	Explanation
SPN-CPAP/VS	Spontaneous-Continuous Positive Airway Pressure/Volume Support, spontaneous breathing with continuous positive pressure level with or without volume support
SPN-PPS	Spontaneous-Proportional Pressure Support, spontaneous breathing with flow-proportional and volume-proportional pressure support
SpO_2	Partial O_2 saturation
Tapn	Apnea alarm time (set value)
TC	Time constant tau
Tdisconnect	Time for disconnection alarm (set value)
Te	Expiratory time (set value)
TGI	Tracheal Gas Insufflation
Thigh	Time of upper pressure level in APRV (set value)
Ti	Inspiratory time (set value)
Timax	Maximum inspiratory time for flow during pressure or volume support (set value)
Tispon	Inspiratory time of sigh for spontaneous breathing
Tisupp	Inspiratory time during pressure support
Tlow	Time of lower pressure level in APRV
Tlow max	Maximum expiratory time during APRV (set value)
TmanInsp	Duration of the breath for manual inspiration during NIV (patient category ***Neo.***, ventilation mode SPN-CPAP)
Tplat	Time of inspiratory plateau
Trach.	Tracheostomy tube
Tube Ø	Inner diameter of tube (set value)

Abbreviation	Explanation
UMDNS	Universal Medical Device Nomenclature System, nomenclature for medical devices
U_N	Rated voltage
USB	Universal Serial Bus, serial bus system
VG	Volume Guarantee
Vol. Assist	Volume support in SPN-PPS (set value)
VS	Volume Support
VT	Tidal volume, leakage-corrected
VTapn	Tidal volume of apnea ventilation (set value)
VTe	Expiratory tidal volume, not leakage-corrected
VTemand	Expiratory tidal volume during a mandatory breath
VTespon	Expiratory tidal volume during a spontaneous breath
VTi	Inspiratory tidal volume, not leakage-corrected
VTimand	Inspiratory tidal volume during a mandatory breath
VTispon	Inspiratory tidal volume during a spontaneous breath
VTmand	Tidal volume during a mandatory breath
VTmax	Maximum tidal volume in SPN-PPS (set value)
VTspon	Tidal volume during a spontaneous breath

Symbols

Symbol	Explanation
	Temporarily suppress acoustic alarm
	Group Views, screen displays
	Group Trends/Data, information on the course of ventilation
	Group Special maneuvers
	Group Alarms
	Group Therapy, ventilation parameter settings
	Group configuration, system settings, and settings for sensors
	Group Start/Standby
	System on or off (at the key on Infinity C500)
	Alarm limit off
	Configure trends
	Save screen display
	View 1
	View 2
	View 3
	Medication nebulizer
	Charge state of batteries 90 to 100 %
	Charge state of batteries 60 to <90 %
	Charge state of batteries 40 to <60 %
	Charge state of batteries 20 to <40 %
	Charge state of batteries <20 %
	Batteries defective or no information available on their charge state
	Lower alarm limit
	Upper alarm limit

Symbol	Explanation
	Setting or access locked
	Expiratory valve locked
	Setting or access unlocked
	Expiratory valve unlocked
	Gas outlet (EXHAUST – NOT FOR SPIROMETER)
	Pediatric patient category (***Ped. pat.***)
	Neonates patient category (***Neo.***)
	Display additional information or open Help
	Hide additional information or close Help
	Scroll back in tables or lists
	Scroll forward in tables or lists
	Scrolling forward in Help
	Scrolling backward in Help
	Close dialog window
	Active test in the device check
	Spontaneous breathing activity by the patient
	Suppress acoustic alarm for 2 minutes
	Mains power supply (AC voltage)
	GS500: Mains power supply (AC voltage, if separate mains plug is available)
	Power supply from batteries
	Caution: Observe important safety information and precautions in the Instructions for Use.
	Instructions for Use, observing
	Connection for equipotential bonding
	Protective earth

Symbol	Explanation
	Application part type BF
	Nurse call
	Marking point on the trolley – do not lean, press, push or pull against the trolley above the marking points
	ESD warning symbol
	ESD warning symbol
	Information on disposal
	Manufacturer
 20XX	Date of manufacture
	Connection for the neonatal flow sensor
	Device ready to switch on
	Device switched off
	Labeling for FCC approval
	Caution: Federal Law restricts this device to sale by or on the order of a physician.
	Serial interface (on Infinity C500)

Additional symbols on Infinity C500 (Medical Cockpit) that are not described in these Instructions for Use are described in the Instructions for Use for "Infinity Medical Cockpits".

Operating concept

Operating concept for Infinity C500

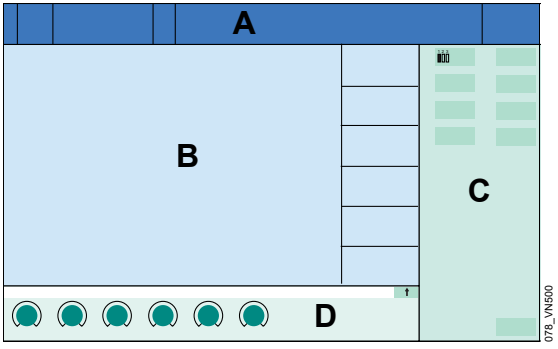
Infinity C500 is the central operating and display unit. The general operating concept is described in the Instructions for Use for "Infinity Medical Cockpits".

Operating concept for Babylog VN500

The following operating concept only contains the specific information and operating steps for Babylog VN500.
This chapter describes:
- Main screen
- Main menu bar
- Dialog windows
- Therapy bar
- Therapy controls
- Setting ventilation parameters
- Exceeding the set limit of a ventilation parameter
- Direct setting of ventilation parameters (QuickSet)
- Linked setting of ventilation parameters

Main screen

The main screen displays the most important ventilation information at a glance.



A **Header bar** with the following fields:
- Patient category, see page 60
- System data, e.g., state of charge of the batteries, see page 105
- Therapy status: Therapy type (ventilation or O_2 Therapy), ventilation mode and additional settings
- Alarms, messages and instructions for the user, see page 108
- Alarm status

B **Monitoring area** with curves, loops, trends and measured values, see page 84. The display can be configured, see page 140.

C **Main menu bar** with buttons for opening dialog windows and activating functions, see page 33.

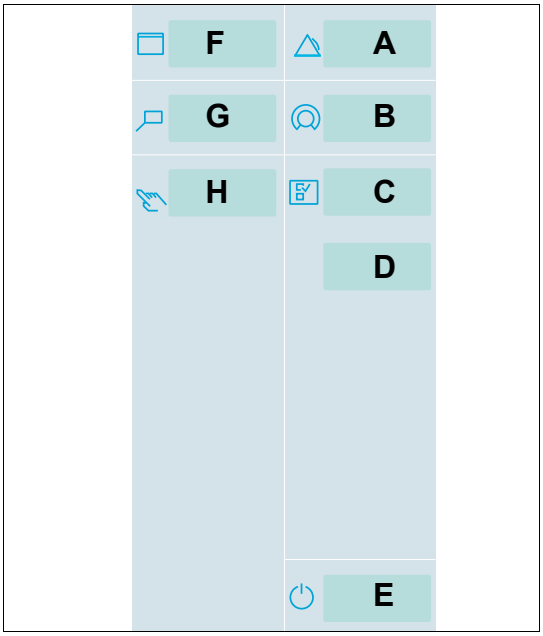
D **Therapy bar** with the therapy controls for the ventilation parameters of the active ventilation mode, see page 34.

The main screen can be configured for direct access as a ***Main screen*** button in the main menu bar. See "Assigning functions to additional buttons" on page 142.

Main menu bar

The main menu bar contains fixed assigned and configurable buttons. The buttons are assigned to various groups. Touching a button opens the corresponding dialog window or activates the corresponding function.

Fixed assigned buttons



A ***Alarms...*** for setting the alarm limits and displaying the alarm logbook and listing all active alarms, see page 108.

B ***Ventilation settings...*** for setting the ventilation mode and the ventilation parameters, see page 74.

C ***Sensors/ Parameters...*** for calibrating the sensors and for activating or deactivating monitoring, see page 123.

D ***System setup...*** for configuring the device functions, see page 137.

E ***Start/ Standby...*** for selecting standby mode or starting therapy, see page 101.

F ***Views...*** for switching to other configured monitoring area views, see page 84.

G ***Trends/Data...*** for displaying all the measured and set values, logbook, trends and for exporting data, see page 115.

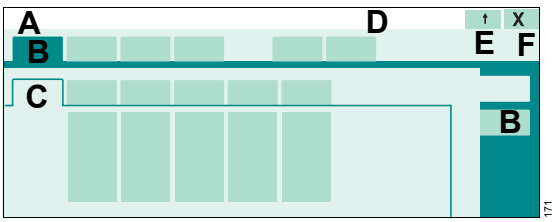
H ***Special maneuvers...*** for selecting additional functions, e.g., suction maneuver, see page 90, or medication nebulization, see page 92.

Configurable buttons

Additional buttons for directly accessing functions or dialogs can be configured. These buttons are spatially assigned to the corresponding group. See "Assigning functions to additional buttons" on page 142.

Dialog windows

Dialog windows consist of one or several pages which are displayed by touching the corresponding horizontal or vertical tab. Dialog windows contain elements for operating the device and informing the user on current settings. Dialog windows can be opened by touching a button in the main menu bar.



A Dialog window title

B Tab to open a page

C Opened page of the dialog window

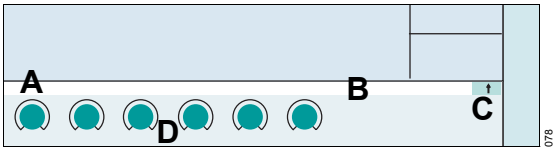
D Message field for dialog-specific information and instructions

E Button for accessing additional information and the ***Help*** function (if available)

F Button for closing the dialog window

Therapy bar

The therapy bar on the main screen contains the therapy controls for the active ventilation mode.



A Name of active ventilation mode

B Message field for specific messages on the active ventilation mode

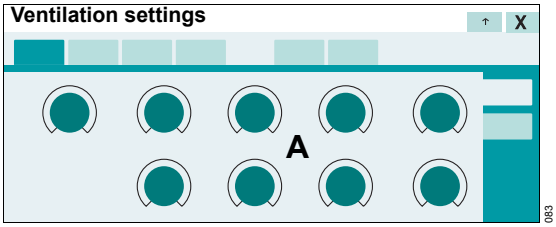
C Button for opening the dialog window for the ventilation settings of the active ventilation mode

D Therapy controls

Therapy controls

The therapy controls (A) are used to set the ventilation parameters.

Therapy controls are contained in the therapy bar of the active ventilation mode and in the dialog window for the ventilation settings.



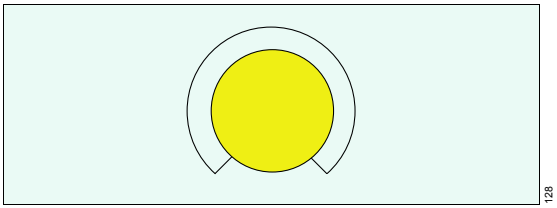
Start-up settings

Arrows ▶ beside the scales on the therapy controls indicate the start-up values valid when Babylog VN500 is switched on. These start-up values can be adjusted specifically as required by the hospital. See "Configuring start-up settings for the ventilation parameters" on page 150.

Locking mechanism

The therapy controls in the therapy bar can be locked against the ventilation parameters being changed by accident. See "Locking of therapy controls in therapy bar" on page 144.

Setting ventilation parameters



1. Touch the therapy control. The color turns yellow. The unit of the parameter to be adjusted is displayed in parentheses.
2. Turn the rotary knob to set the value.
3. Press the rotary knob to confirm the value. The color of the therapy control turns dark green.

The following chapters of the Instructions for Use provide a simplified explanation of these steps: "Use the rotary knob to set and confirm the value."

Exceeding the set limit of a ventilation parameter

When a set limit of a parameter has been reached, Babylog VN500 displays a message.

- Press the rotary knob to exceed the set limit.

The set limit can be exceeded.

If the maximum set limit for a parameter has been reached, e.g., when it is dependent on other parameters, it is not possible to exceed the set limit.

- Press the rotary knob. Babylog VN500 adopts the maximum possible set value.

Direct setting of ventilation parameters (QuickSet)

When a ventilation parameter is set directly, the changes to a setting become immediately effective for the patient. The user can immediately see the effect the changed setting has on the patient. The finally chosen setting does not have to be confirmed again.

Ventilation parameters can be set directly in all ventilation modes and can be carried out in the dialog window for the ventilation settings. Direct settings are only possible in the therapy bar when the therapy controls are not locked.

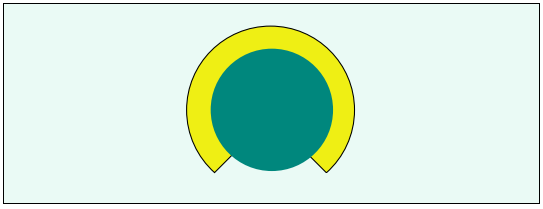
O_2 and Flow cannot be set directly.

Setting ventilation parameters directly

1 Touch the corresponding therapy control.

2 Press and hold the rotary knob for approximately 3 seconds.

The therapy control changes to dark green with a yellow edge. The direct setting function is now active.



3 Press and hold the rotary knob and turn to set the value.

The set value is immediately effective.

Exceeding the set limit of a parameter with direct setting

When a set limit of a parameter has been reached, Babylog VN500 displays a message.

4 Release rotary knob for a short moment.

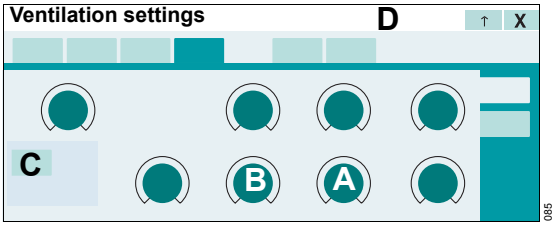
5 Press the rotary knob again and turn it.

The set limit can be exceeded.

Linked setting of ventilation parameters

The linked setting is possible for ***PEEP/Pinsp*** and for ***RR/Ti***.

Linking *PEEP*/*Pinsp*



1 Touch the therapy control ***PEEP*** (A) or ***Pinsp*** (B); the color turns to yellow.

The ***Link*** button (C) is displayed.

2 Touch the ***Link*** button (C).

The therapy control of the other linked parameter to be linked (***Pinsp*** or ***PEEP***) turns yellow.

3 Turn the rotary knob to set the value for ***PEEP*** and ***Pinsp***. The other value is also automatically changed so that the difference in pressure remains constant.

4 Press the rotary knob to confirm the value.

Both therapy controls turn dark green.

Linking *RR*/*Ti*

Setting ***RR*** and ***Ti*** is effected analogously to the linked setting of ***PEEP*** and ***Pinsp***. The I:E ratio remains constant. If the respiratory rate is increased, the inspiratory time is reduced. If the inspiratory time is increased, the respiratory rate is reduced.

Additional information

If a condition is reached in which a parameter cannot be changed anymore when setting linked parameters, Babylog VN500 displays a corresponding message in the message field (D).

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Assembly and preparation

Safety information for assembly and preparation

WARNING

Before each use, reprocess the device and all accessories in accordance with the Instructions for Use, see "Reprocessing List" on page 204. Comply with the hospital hygiene regulations!

WARNING

The device must not be tilted more than 10°! Failure to observe this may result in the device toppling over. Danger of damage to device or personal injury!

WARNING

Securely mount Babylog VN500. Check for secure fit. Danger of damage to device or personal injury!

WARNING

Do not place any containers with liquid on or above the device! Penetrating liquid may cause malfunction of or damage to the device, which may endanger the patient.

WARNING

Failure to observe the permitted maximum load and weight distribution may result in the device toppling over. Danger of damage to device or personal injury! Observe the permitted maximum load and weight distribution, see "Maximum load" on page 235.

CAUTION

When parking the device, lock all the double castors of the trolley and check that the brakes are working properly.

Preparing Trolley 2 - 90 cm

Safety information on the trolley

WARNING

Do not use the trolley in the event of visible damage, e.g., damaged double castors! Call DrägerService.

WARNING

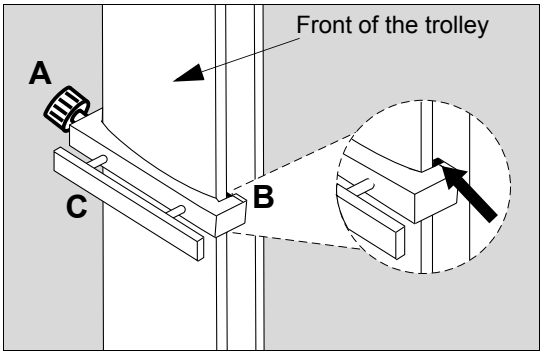
Do not lean, press, push or pull against the trolley above the marking points on the trolley. The trolley could topple over.

CAUTION

Connect all devices securely to the trolley. Check for secure fit. Danger of damage to device or personal injury!

Connecting the universal holder with standard rail to the trolley

Attach the universal holder with standard rail to the front of the trolley.



1 Unscrew the adjusting screw (A) completely.

2 Attach the right-hand side of the universal holder to the right-hand side of the rail (B). Make sure that the catch of the universal holder is completely behind the alignment aid.

3 Align the universal holder (C) horizontally and press the left-hand side of the universal holder onto the left-hand side of the column.

4 Tighten the adjusting screw (A). Make sure that the catch of the universal holder is completely behind the alignment aid.

5 Check that the universal holder is fixed securely.

Adjusting the height of the universal holder

1 Unscrew the adjusting screw (A).

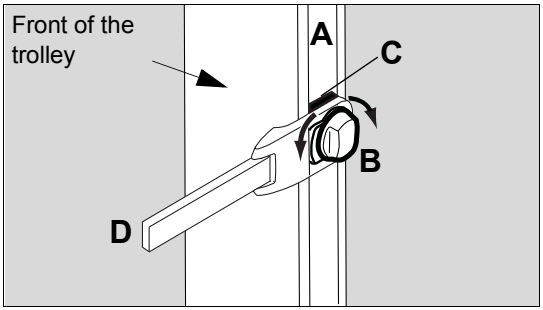
2 Adjust the height of the universal holder (C).

3 Align the universal holder horizontally.

4 Retighten the adjusting screw (A).

Connecting the humidifier holder to the trolley

The humidifier holder is attached to the front of the trolley. The humidifier holder can be fastened on the left or right-hand side of the trolley column. The attachment of the humidifier holder on the right-hand side is shown.



1 Hold the humidifier holder at the desired height on the guide (A) of the trolley column.

2 Turn the clamping screw (B) to the left until the base (C) fits into the guide of the trolley column.

3 Turn the clamping screw (B) to the right until the humidifier holder is secured firmly in the guide.

4 Move the standard rail (D) to the desired position.

Securing accessories to the standard rail

Secure the accessories, e.g., breathing gas humidifier or medication nebulizer, to the standard rail. Observe the maximum load! See chapter Technical Data, "Maximum load" on page 235.

Securing the compressed gas cylinders to the trolley

Only available with the cylinder holder option

WARNING

Securely attach the compressed gas cylinders to the trolley, using both Velcro fasteners. Otherwise there is a risk of the trolley toppling over. Danger of damage to device or personal injury!

WARNING

Have the height of the upper holder adjusted to the respective compressed gas cylinders by service personnel. The height must be adjusted so that the top half of the compressed gas cylinders are secured by the Velcro strip. Otherwise there is a risk of the trolley toppling over. Danger of damage to device or personal injury!

WARNING

The length of the Velcro fasteners must match the diameter of the compressed gas cylinders to ensure that the Velcro fasteners can hold the cylinders securely. If necessary have an appropriate Velcro strip fitted by service personnel. This is essential to ensure that the compressed gas cylinders are properly secured.

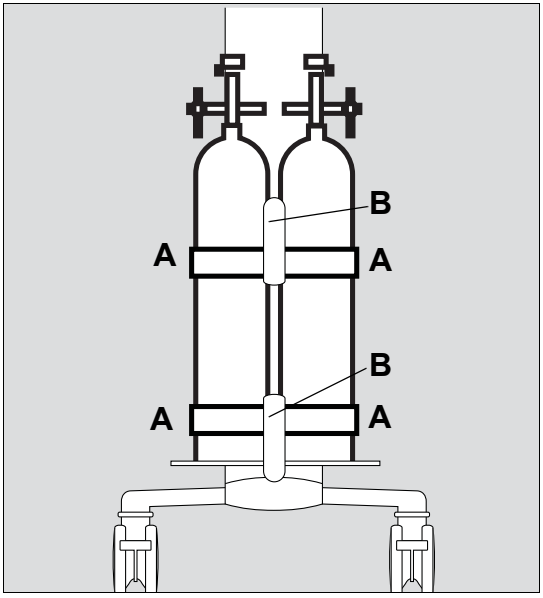
Compressed gas cylinders with the following dimensions can be secured:

Diameter:	80 to 176 mm (3.15 to 6.93 in)
Length:	420 to 760 mm (16.54 to 29.92 in)

WARNING

Not every combination of compressed gas cylinder diameter and length can be secured. When used in combination with a pressure reducer, the compressed gas cylinder must not come into contact with the console of the trolley. The maximum diameter is 176 mm (6.93 in) when the base of the compressed gas cylinder is resting completely on the base plate of the lower holder or is semi-spherical in shape.

1. Place the cylinders into the mountings on the trolley.
2. Secure each cylinder with 2 Velcro fasteners (A).
3. Secure the compressed gas hoses by hanging them over the hose hooks (B).



WARNING

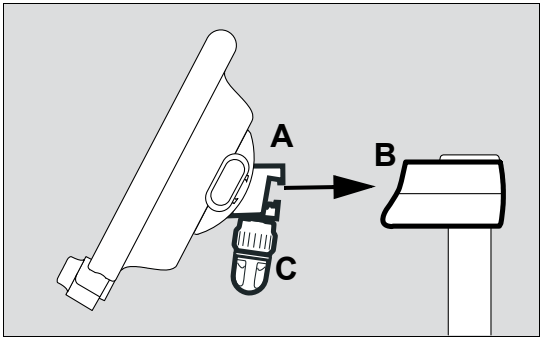
Position the compressed gas cylinders fitted with pressure reducers in such a way to prevent the pressure reducers from being damaged during transport. The lower part of the trolley is designed to protect against collisions. Take particular care when the compressed gas cylinders being used extend beyond this collision protection.

Preparing Infinity C500

Positioning Infinity C500

Infinity C500 is suitable for positioning on the trolley or on a standard rail.

Positioning Infinity C500 on the trolley



1. Hook the Infinity C500 holder (A) into the mounting (B) on the trolley.
2. Tighten the locking screw (C).
3. Make sure that Infinity C500 is securely attached to the trolley.

Positioning Infinity C500 on a standard rail

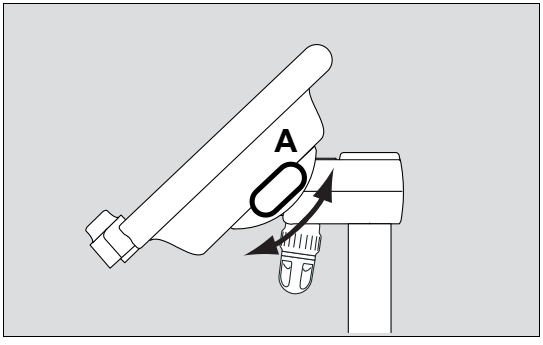
When Infinity C500 is connected to the trolley:

1. Unscrew the locking screw (C).
2. Lift Infinity C500 out of the mounting (B) on the trolley.
3. Hook Infinity C500 into the standard rail.
4. Tighten the locking screw.
5. Make sure that Infinity C500 is securely attached to the standard rail.

Adjusting the position of Infinity C500

Tilting the position of Infinity C500

Infinity C500 can be tilted down and up.



1 Press and hold the tilt release button (A).

2 Tilt Infinity C500 to the desired working position.

3 Release the button and make sure that it engages securely.

Turning Infinity C500

Infinity C500 can be turned by a maximum of 180° to the left or 90° to the right.

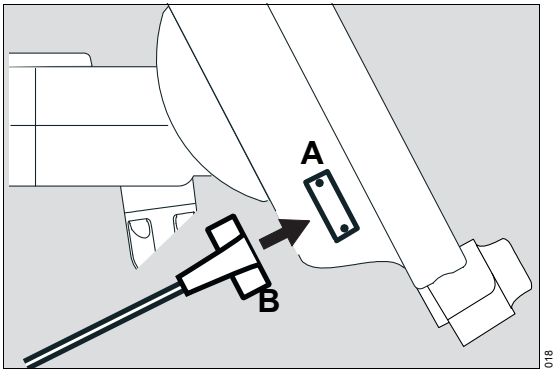
- Turn to the desired working position.

Connecting system cables

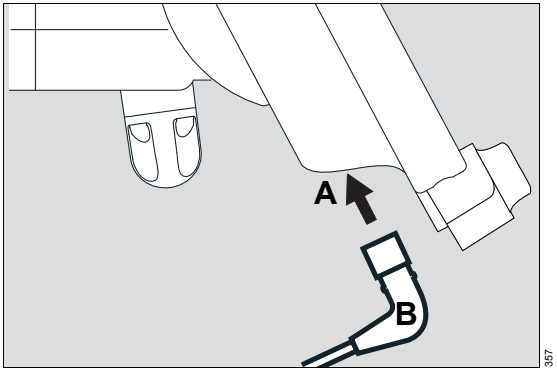
The system cable is connected to Infinity C500 and to Babylog VN500. The system cable is fixed in a clamp.

Connecting the system cable to Infinity C500

On Infinity C500 (MS18746):



On Infinity C500 (MK31500):



1 Unscrew the cover from the socket (A).

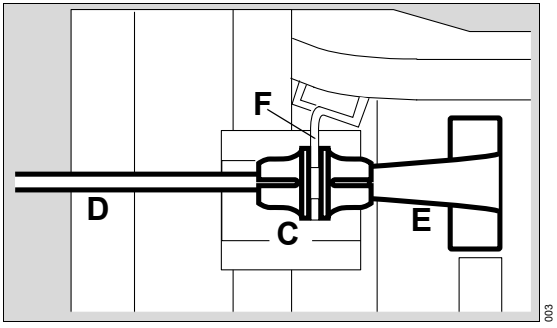
2 Insert the system cable connector (B) into the socket (A). Ensure that the connector is inserted with the correct orientation.

3 Screw the cover back on.

Connecting the system cable to Babylog VN500

1 Open the flap on the left-hand side of Babylog VN500.

2 Run the system cable between Babylog VN500 and the handle.



3 Clip the protective sleeve (C) immediately after the connector (E) onto the system cable (D). Align the protective sleeve so that the slots of the protective sleeve are facing downwards and upwards.

4 Insert the system cable connector (E) into the socket until the connector audibly clicks into place.

5 Insert the protective sleeve (C) into the protective plate (F) at the same time.

6 Turn the protective sleeve (C) by approximately 90° until it clicks into place. The cable is secured.

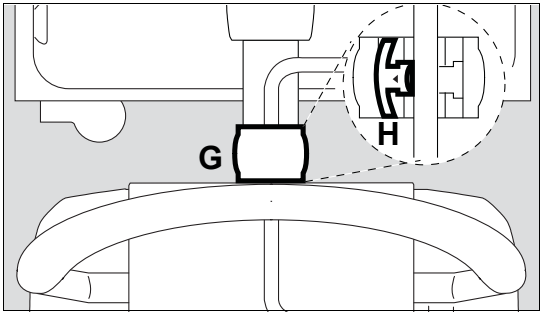
7 Close the left-hand flap.

Disconnecting the system cable from Babylog VN500

1 Push the locking mechanism on the connector (E) backwards and pull out the connector.

2 Turn the protective sleeve (C) by approximately 90° and remove it from the protective plate (F).

Fixing the system cable in the clamp (G)



1 Open the clamp cover (H).

2 Place the system cable into the clamp. Keep the cable length short between the clamp and Babylog VN500.

3 Close the clamp cover (H) and engage. Ensure that the cover engages securely.

Removing the system cable from the clamp

1 Open the clamp cover.

2 Remove the cable from the clamp.

3 Close the clamp cover and engage.

Using the MEDIBUS or the MEDIBUS.X protocol

NOTE

All transferred data is for informational purposes only and must not be used as basis for diagnostic or therapeutic decisions.

MEDIBUS and MEDIBUS.X are software protocols for transferring data between Babylog VN500 and an external medical or non-medical device (e.g., patient monitors or computers for data management systems).

The combination of Babylog VN500, Infinity C500 and the external device must comply with the requirements of the IEC/EN 60601-1-1 and IEC/EN 60601-1-2 standards.

Additional information

For MEDIBUS:

"MEDIBUS for Evita Infinity V500, Babylog VN500" (9039527)

"Dräger RS 232 MEDIBUS, Protocol Definition" (9028258)

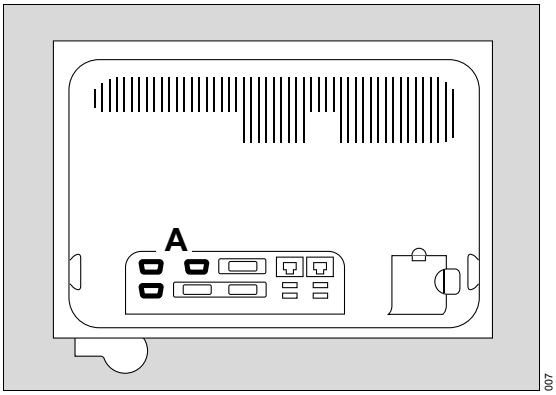
For MEDIBUS.X:

"MEDIBUS.X, Rules and Standards for Implementation" (9052607)

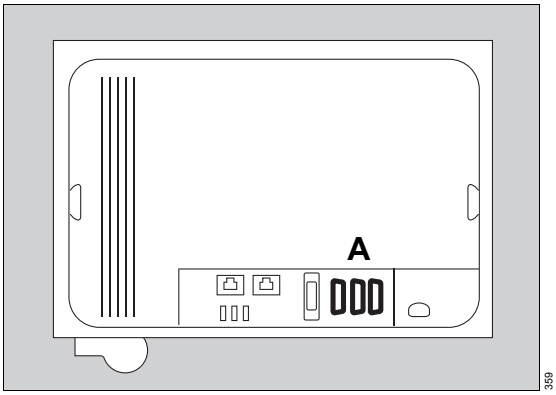
"MEDIBUS.X, Profile Definition for Data Communication V1.0" (9052608)

Connecting an external device for using MEDIBUS or MEDIBUS.X

On Infinity C500 (MS18746):



On Infinity C500 (MK31500):



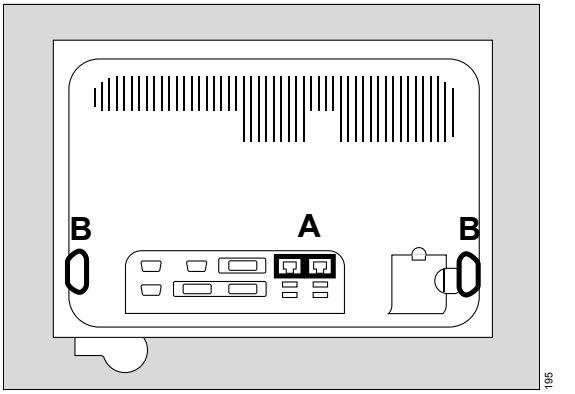
- Connect an external device to the interface COM 1, COM 2 or COM 3 (A) of Infinity C500. Use MEDIBUS cable 8416326.

Configuring the interface

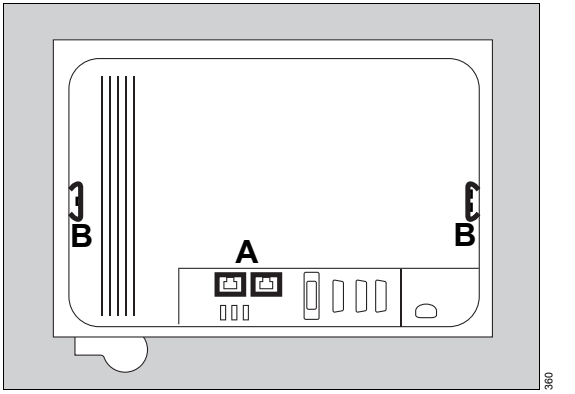
A description is given in chapter "Configuring interfaces" on page 161.

LAN and USB interfaces of Infinity C500

On Infinity C500 (MS18746):



On Infinity C500 (MK31500):



Use of LAN interfaces (A) of Infinity C500 is exclusively permitted for service purposes.

The USB interfaces (B) must only be used for connecting USB storage media or a USB SIM card reader.

WARNING

Do not simultaneously touch the connectors of the interfaces and the patient. Danger of electrical shock.

Preparing Babylog VN500

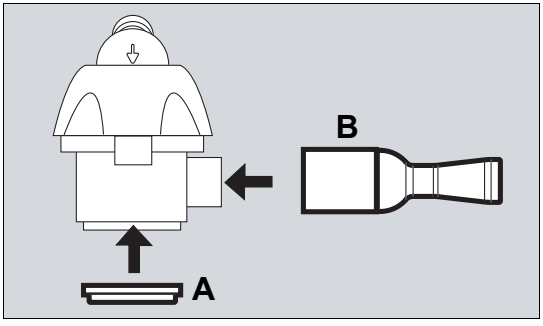
Preparing the Infinity ID neonatal expiratory valve

WARNING

Only use properly reprocessed expiratory valves which have been sufficiently dried. Otherwise the proper functioning of the device may be impaired and the patient endangered.

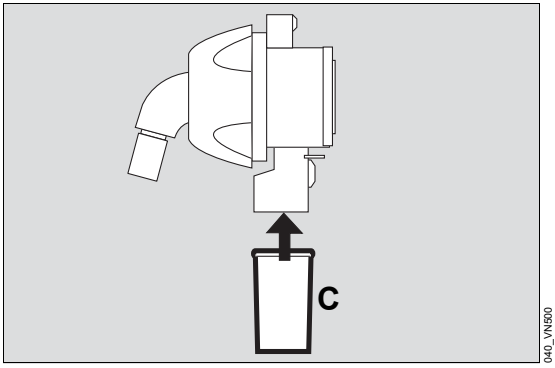
The expiratory valve is mounted and then inserted into the ventilation unit.

Mounting the Infinity ID neonatal expiratory valve



1 Fit the diaphragm (A) onto the edge of the expiratory valve housing. Make sure that the diaphragm is fitted properly.

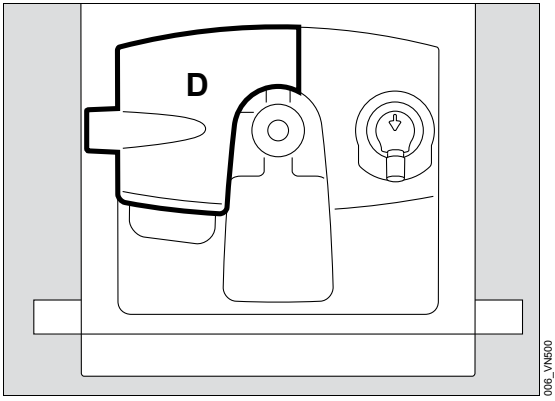
2 If the muffler (B) has been removed, fit the muffler.



3 Fit the collection container for the water trap (C).

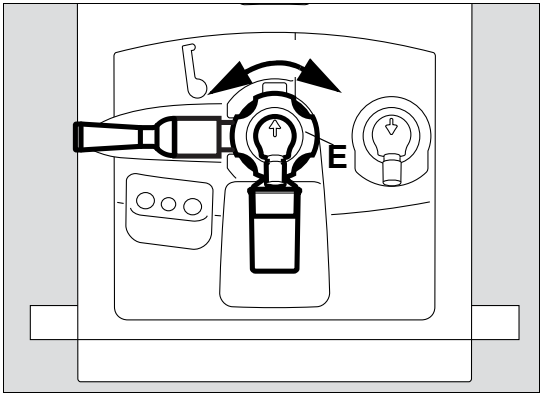
Open the flap

Open the flap (D) before inserting the expiratory valve.



- Open the flap (D) by lifting the lower edge upwards.

Inserting the expiratory valve into the ventilation unit



1 Turn the locking ring (E) as far as possible to the left.

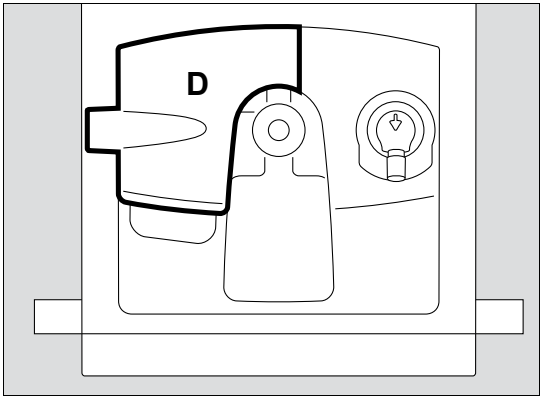
2 Push the expiratory valve into the fitting.

3 Turn the locking ring (E) as far as it will go to the right until it clicks audibly into place.

4 Check that it is properly secured by gently pulling on the expiratory valve.

Closing the flap

When the Infinity ID expiratory valve and the muffler are fitted, tilt the flap (D) downwards.



Leave the flap closed during ventilation.

Safety information for the use of HMEs, bacterial filters and breathing circuits

CAUTION

Additional components in the breathing circuit such as bacterial filters or HME increase the dead space and result in the increase of compliance or resistance. The use of additional components therefore requires particular care and monitoring!

Additional components in the breathing circuit can increase the inspiratory and expiratory breathing resistance and exceed standard requirements. Examples: Inspiratory and expiratory bacterial filters, HMEs.

Babylog VN500 is designed to minimize the patient's work of breathing. Operation does therefore not require inspiratory or expiratory bacterial filters. The use of bacterial filters or HMEs requires particular care and monitoring by the user. Especially during medication nebulization and humidification, the resistance of the expiratory bacterial filter may increase gradually.

A higher breathing resistance leads to a greater work of breathing and trigger effort. Under unfavorable conditions, this can lead to an intrinsic PEEP, which can be recognized by the fact that the expiratory flow does not return to "baseline" at the end of expiration. If the PEEP is unacceptably high, this is indicated by an alarm. The measured PEEP is then more than 4 mbar (4 cmH_2O) above the set PEEP. If the end-expiratory flow is high, the alarm threshold increases to a measured PEEP value of up to 12 mbar (12 cmH_2O).

A breathing resistance in the patient connection cannot be monitored directly by Babylog VN500. For this reason:

- Before starting ventilation, determine in standby mode inspiratory and expiratory breathing resistance in the breathing circuit by means of the breathing circuit check.
- Check the condition of the patient and the device's measured values for volume and resistance more frequently.

- Observe the Instructions for Use for the HMEs, bacterial filters and breathing circuits in use.

Preparing the breathing gas humidifier

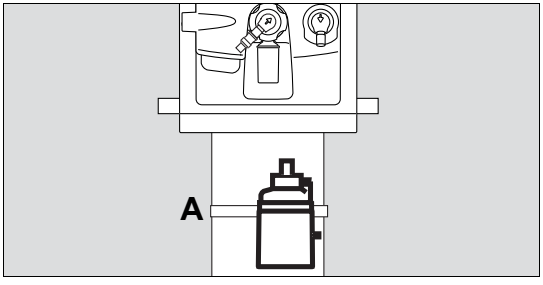
- Prepare the Fisher & Paykel MR 850 breathing gas humidifier in accordance with the corresponding Instructions for Use.

CAUTION
Do not use an HME together with a breathing gas humidifier! This can lead to an increased breathing resistance.

Connecting the Fisher & Paykel MR 850 breathing gas humidifier

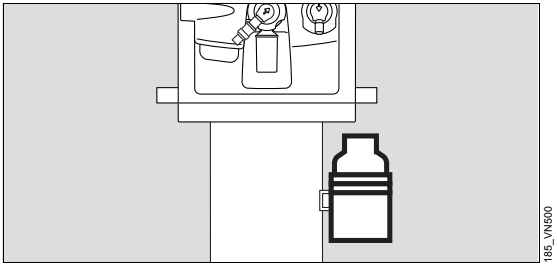
The breathing gas humidifier can be connected in the following ways:
– on the standard rail of the universal holder
– on the humidifier holder of the trolley
– on the humidifier holder on the side rail

Connecting the breathing gas humidifier on the universal holder with standard rail



- Clamp the breathing gas humidifier to the standard rail (A) under the ventilation unit and screw firmly into place.

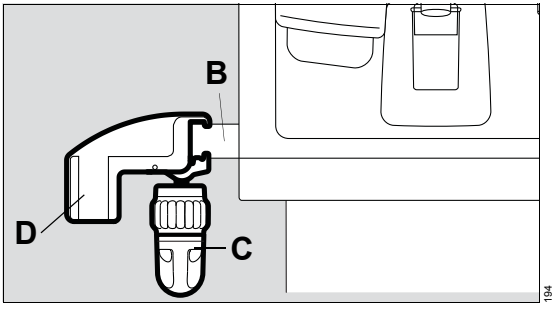
Connecting the breathing gas humidifier to the humidifier holder of the trolley



- Connect the breathing gas humidifier to the humidifier holder of the trolley.
- Tilt the breathing gas humidifier into the correct position.

Connecting the breathing gas humidifier to the humidifier holder on the side rail

If a compressor is used on the trolley, use humidifier holder on the side rail. The holder can be connected to the left-hand or right-hand side of device.



1 Hook the holder on the lateral standard rail (B) of Babylog VN500. Position the holder on the standard rail so that the flap at the side of the unit can still be opened.

2 Turn the clamping screw (C) until the holder is fixed securely on the rail.

3 Attach the breathing gas humidifier to the mount (D).

Additional information

For the order numbers of the holder for the breathing gas humidifier, see the list of accessories.

Connecting the breathing circuit

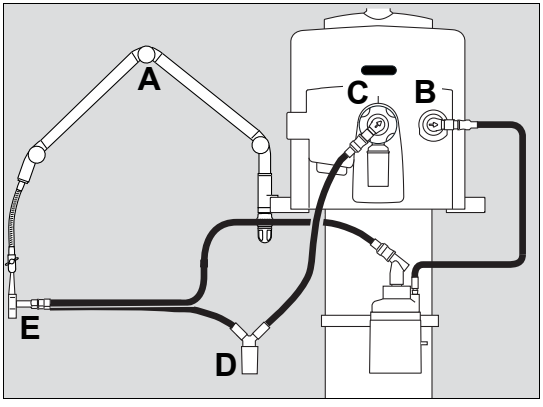
WARNING

Do not use antistatic or conductive breathing hoses. The use of these materials increases the danger of electrical shock to the patient and of fire in an oxygen-enriched environment.

CAUTION

The sterile packaging of disposable articles must only be opened immediately before use. Otherwise there is a risk of infection.

1 Hang the hinged arm (A) on the lateral standard rail of Babylog VN500 and tighten the screws. Depending on the desired position of the device in relation to the bed, the hinged arm can be fitted to either side of Babylog VN500.



2 Connect breathing hoses to the inspiratory port (B) and to the expiratory port (C).

CAUTION

Do not reverse the connections for inspiration (B) and expiration (C). Humidification is ineffective if the connections are reversed.

3 Turn the inspiratory port and expiratory port in the direction of hoses.

A water trap is required for the Fisher & Paykel MR 850 breathing gas humidifier depending on the breathing circuit used.

4 If a water trap is required, install the water trap (D) in a vertical position.

5 Connect the Y-piece (E) to the breathing hoses.

6 Insert the Y-piece or the breathing hoses in the opening of the hinged arm.

Using the Infinity ID breathing circuit

Babylog VN500 recognizes the use of an Infinity ID breathing circuit. The message ***Infinity ID breathing circuit detected.*** is displayed in the header bar.

The following Infinity ID functions are supported:
– Detection of reversed hoses
– Detection of non-compliance with the settings for the breathing circuit, patient category or humidification type
– Automatic configuration of breathing circuit and humidifier

Automatic configuration of the breathing circuit and the humidifier is only supported in standby mode.

- Fit the Infinity ID breathing hoses in standby mode.

If accessories without RFID functionality are combined with Infinity ID accessories, the RFID functionality may be limited or not available.

Setting the breathing circuit

Babylog VN500 supports the user in selecting the breathing circuit on the page ***Start/Standby > Br. circuit/ Humidifier***.

- Set the breathing circuit according to the patient category.

Whenever the breathing hoses or the breathing gas humidifier have been changed

- Check the breathing circuit, see "Performing the breathing circuit check" on page 67.

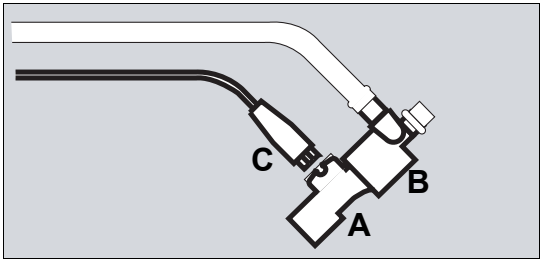
Additional information

For the order numbers of the breathing circuits and the hinged arm, see the list of accessories.

Installing a neonatal flow sensor

The following neonatal flow sensors are available:
– Neonatal flow sensor ISO 15 (8411130)
– Neonatal flow sensor Y-piece (8410185)

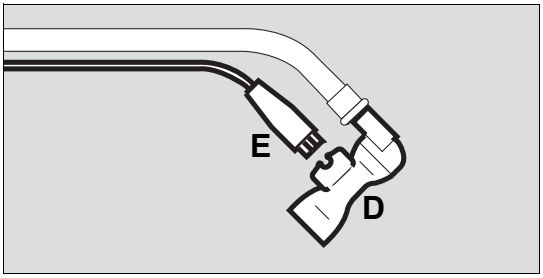
Installing a neonatal flow sensor ISO 15 (8411130)



1 Insert the neonatal flow sensor (A) into the patient connector of the Y-piece (B).

2 Connect plug (C) of the flow sensor cable to the flow sensor.

Installing a neonatal flow sensor Y-piece (8410185)



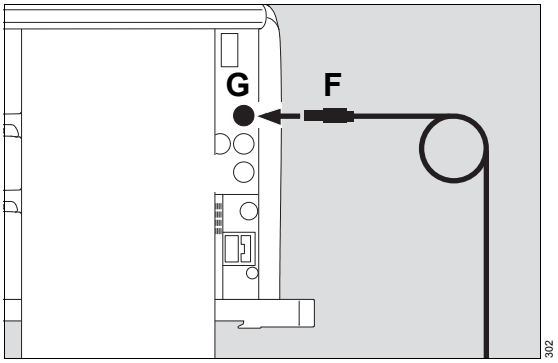
1 Connect Y-piece with integrated neonatal flow sensor (D) to the breathing hoses.

2 Connect plug (E) of the flow sensor cable to the flow sensor.

Further procedure for both neonatal flow sensors

3 Position patient connector of the Y-piece about 45° downwards to prevent condensation from forming on the neonatal flow sensor.

4 Run the cables along the breathing hoses to the device.



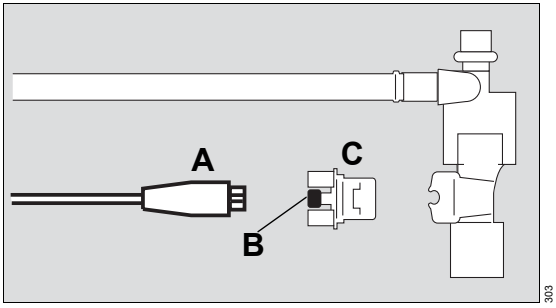
5 Insert the connector (F) of the flow sensor cable into the socket (G) at the rear of Babylog VN500.

Additional information

For the order numbers of the neonatal flow sensor, see the list of accessories.

Replacing the neonatal flow sensor insert

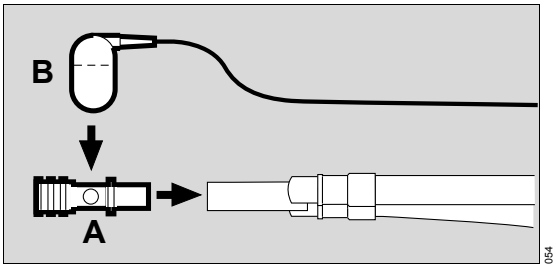
If Babylog VN500 displays the alarm message ***Neonatal flow sensor?***, then the insert of the neonatal flow sensor must be replaced.



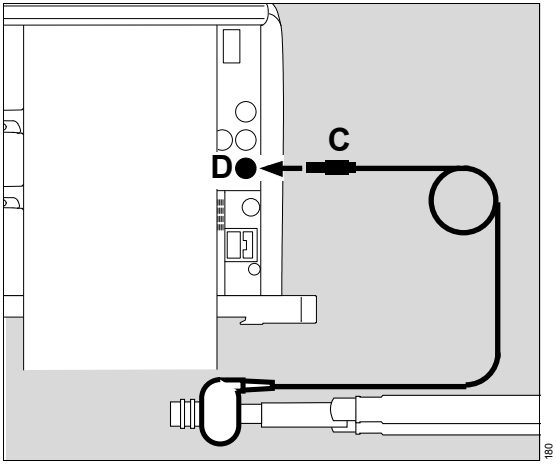
1. Disconnect plug (A) of the flow sensor cable from the neonatal flow sensor.
2. Gently press the knobs (B) on both sides while pulling the insert (C) out of the flow sensor housing.
3. Push the new insert (C) into the sensor housing until it engages.
4. Connect plug (A) of the flow sensor cable to the neonatal flow sensor.
5. Calibrate the neonatal flow sensor, see page 125.

Installing a CO_2 cuvette and CO_2 sensor

For premature infants, do not carry out CO_2 measurements because the CO_2 cuvette significantly increases the dead space.



1. Insert the cuvette (A) into the patient connector of the Y-piece. The cuvette windows are facing to the side.
2. Fit the CO_2 sensor (B) on the cuvette. The cable is facing towards the device.



3. Insert the connector (C) of the CO_2 sensor into the socket (D) at the rear of Babylog VN500.
4. Selecting the cuvette type, see page 129.

Additional information

"Information on checking the CO_2 sensor" on page 129.

For the order numbers of the accessories for the CO_2 application, see the list of accessories.

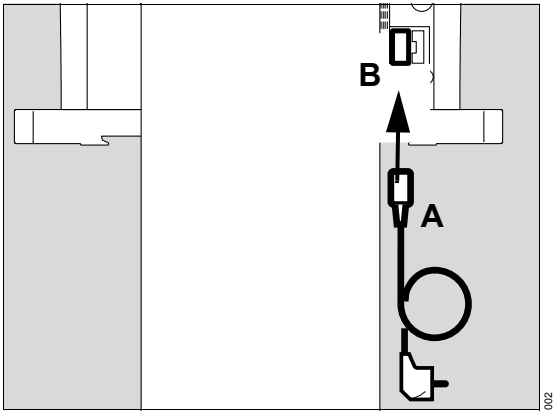
Connecting the mains power supply to Babylog VN500

The mains power must conform with the voltage range specified on the rating plate (100 V to 240 V, 50/60 Hz).

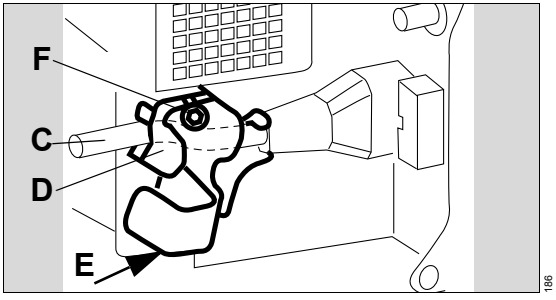
WARNING

To maintain grounding integrity, connect only to a "hospital grade" receptacle. Always disconnect supply before servicing.

1 Plug the appliance socket (A) onto the appliance connector (B).



2 Position the power cable (C) in the clamp (D). Fit the clamp into the housing (E). Tighten the screw (F) (stress relief).



- Insert the mains plug into the mains power socket.

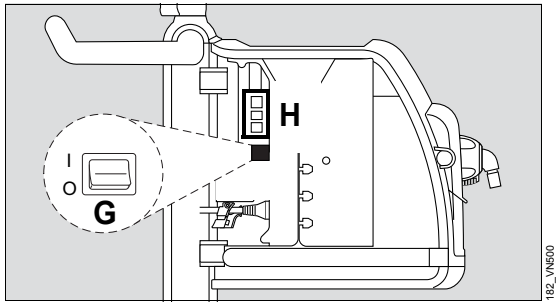
The LED ⏻ on Infinity C500 lights up green.

Checking the toggle switch on Babylog VN500

CAUTION

Do not press the toggle switch during ventilation.

Prerequisite: The flap on the left-hand side of the device is opened.



- Check whether the toggle switch (G) is set to | (on).
- If the toggle switch is set to ○ (off), set the toggle switch to | (on).

WARNING

Do not simultaneously touch the connectors of the interfaces (H) and the patient. Danger of electrical shock.

Connecting the mains power supply to gas supply unit GS500

WARNING
To maintain grounding integrity, connect only to a "hospital grade" receptacle. Always disconnect supply before servicing.

If Babylog VN500 is not equipped with the power supply unit PS500, and the gas supply unit GS500 features a separate mains plug:

- Plug the mains plug of the gas supply unit into the mains socket.

The LED ~ on GS500 lights up green.

Power supply from batteries

If the mains power fails, operation is maintained either via the internal battery of Babylog VN500 or via the power supply unit PS500.

Additional information

For additional information, see "Mains power supply / DC power supply" on page 104.

Failure of the electrical power supply

If the mains power fails, operation is maintained via batteries.

If the mains power fails and the batteries are fully discharged, then Babylog VN500 generates a power failure alarm. The ventilation settings and the alarm limits remain saved even in the event of a power supply failure.

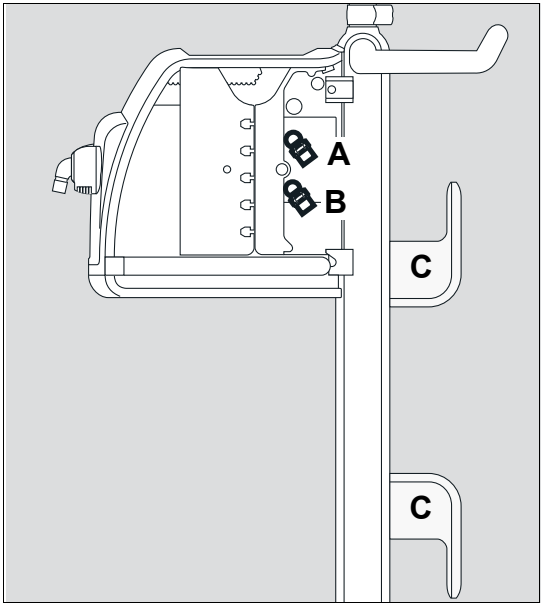
Connecting the gas supply

WARNING
Do not bring any oxygen supply components into contact with oil and grease. Danger of explosion through spontaneous ignition!

WARNING
Only use compressed gases approved for medical use. The compressed gases must be free of dust and oil particles and dry. Otherwise the proper functioning of the device cannot be ensured.

Central gas supply

Prerequisite: The flap on the right-hand side of the device is opened.



1. Screw the Air compressed gas hose to the ***Air*** connection (A) and the O2 compressed gas hose to the ***O2*** connection (B) of Babylog VN500.
2. Plug the probes into the wall terminal units of the central gas supply system.
3. Position the compressed gas hoses over the hose hooks (C).

The gas delivered through compressed gas hoses is used as fresh gas (FRESH GAS).

Additional information

For the order numbers of the compressed gas hoses, see the list of accessories.

Gas supply from cylinders

If the central gas supply fails or is not available, the gas can be supplied from cylinders.

Additional information

Air supply from a gas supply unit (GS500), see "Gas supply unit GS500" on page 98.

Connecting the nurse call

The nurse call is used for transmitting high-priority alarm messages (warning) to a central hospital alarm system.

Safety information for using the nurse call

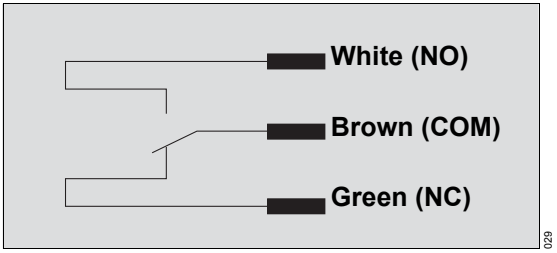
CAUTION
A fault in any of the components in the link between the nurse call and the central hospital alarm system (e.g., in the unit's electronics for nurse call, in the unit's power supply or in the alarm generator of the central hospital alarm system) can result in failure of the nurse call.

CAUTION
Connection of a nurse call does not relieve staff of their duty to check the monitoring on the device screen at regular intervals. Screen displays must be checked regularly.

CAUTION
All alarms of Babylog VN500 must be checked regularly even when the nurse call is connected. Do not use nurse call as the sole source of alarm information!

Connecting the nurse call to the central hospital alarm system

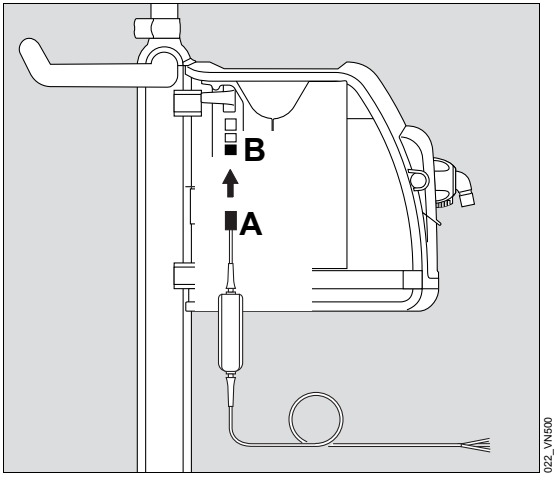
- The nurse call cable must be connected to the lead to the central hospital alarm system by service personnel.



As soon as Babylog VN500 signals an alarm, the connection between the white cable and the brown cable (NO and COM) is closed and the nurse call is activated.

Connecting the nurse call to the ventilation unit

Prerequisite: The flap on the left-hand side of the device is opened.



1 Plug the nurse call connector (A) into the socket (B) until it engages audibly.

NOTE
The connector must engage audibly into the socket to ensure all alarm messages are transmitted properly.

2 Check the correct operation of connected nurse call system.

Information on the nurse call

High-priority alarm messages (warning) are transmitted to a central hospital alarm system. Medium-priority (caution) and low-priority (note) alarm messages are not transmitted.

The nurse call is also activated when the internal acoustic alarm generator in the device is defective.

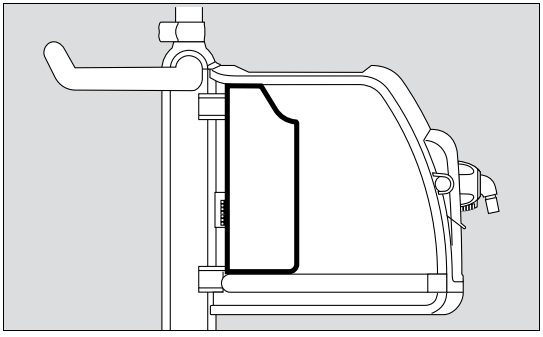
If, in the event of an alarm, the ***Audio paused*** key is pressed, the acoustic alarm of the device and the nurse call are suppressed for 2 minutes.

Additional information

For the order number of the nurse call cable, see the list of accessories.

Closing the flaps at the side of the device

- Close the lateral flaps of the device after preparation.



CAUTION
Keep both lateral flaps on the device closed during operation to prevent accidental actuation of the toggle switch or connections becoming loose.

Transportation of patients within the hospital

WARNING

The device must not be tilted more than 10°! Failure to observe this may result in the device toppling over. Danger of damage to device or personal injury!

WARNING

The device must not be placed on the bed while transferring a patient within the hospital. The device could topple over or fall down. Danger of damage to device or personal injury!

WARNING

Do not lean, press, push or pull against the trolley above the marking points on the trolley. The trolley could topple over.

WARNING

Do not move trolley faster than at a walking pace. There is an increased danger of the trolley toppling over at thresholds, uneven surfaces and ramps. Reduce the speed of transport further. Danger of damage to equipment!

WARNING

Two people are always required to move the device. Otherwise there is an increased risk of the device toppling over.

WARNING

Make sure to securely hold onto the handle of the trolley whenever moving or positioning the device. Otherwise there is an increased risk of the device toppling over.

WARNING

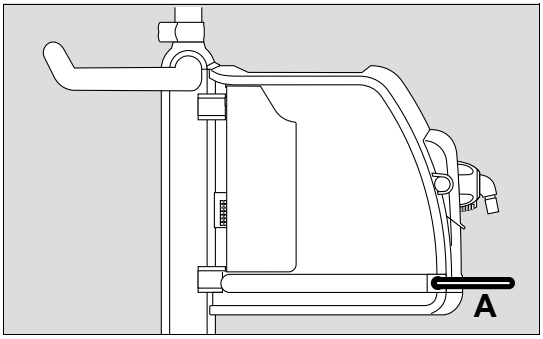
Patient hazard due to discharged batteries. Only start transporting patients when the batteries are sufficiently charged.

When transporting a patient within the hospital, the user must ensure that the patient is monitored at all times.

Using Babylog VN500 with a safety bar

CAUTION

During the transportation of patients within the hospital, Babylog VN500 must be used with a safety bar (A) in order to prevent accidental disconnection of the breathing hoses or damage to the inspiratory port and the expiratory port.



Increasing the toppling stability during the transportation of patients within the hospital

To ensure that the equipment cannot topple over, the accessories must be moved to the most advantageous position:

1 Hinged arm set to minimum deflection.

2 Hoses and cables hooked as close as possible to the trolley.

3 Humidifier secured to the trolley, not to the lateral rails of Babylog VN500.

Additional information

Air supply from the gas supply unit GS500, see "Gas supply unit GS500" on page 98.

Power supply, see "Mains power supply / DC power supply" on page 104.

For the order number of the safety bar, see the list of accessories.

Getting started

Safety information on getting started

WARNING

Ventilation does not take place in standby mode! The device must only be set to standby mode when no patient is connected to the device. The patient may otherwise be jeopardized.

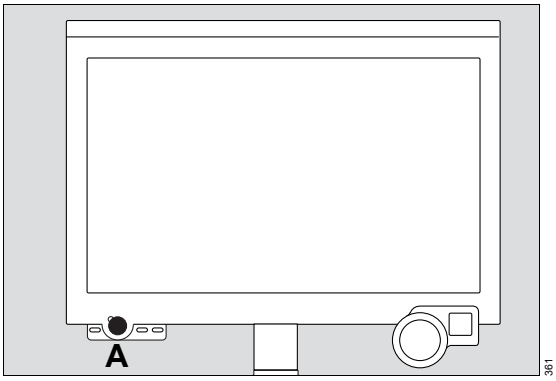
CAUTION

Condensation may form when the device is moved from a cold storage location to a warm environment. Do not switch on the device as otherwise its proper functioning may be adversely affected. Wait until the condensation has dried.

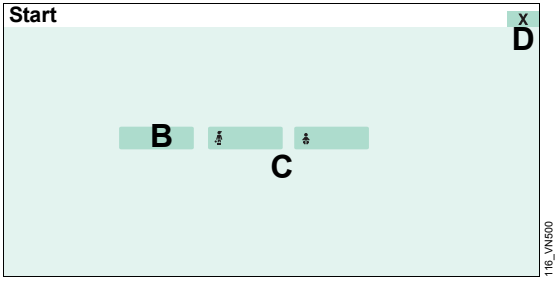
Switching on Babylog VN500 and Infinity C500

Prerequisites:
– Babylog VN500, Infinity C500, PS500 and GS500 are reprocessed and assembled ready for operation.
– The mains power supply and the gas supply are connected.
– The Babylog VN500 toggle switch is set to | (on).

- Press the ⏻ key (A) on Infinity C500.



The system is started. The ***Start*** dialog is displayed.



Babylog VN500 provides you with two options:
– Use settings of previous patient (B)
– Admit new patient (C)

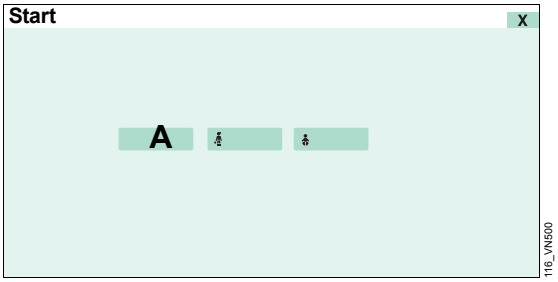
If the ***Start*** dialog is closed via the ***X*** button (D), Babylog VN500 adopts the settings of the previous patient.

If a data loss occurs, the previous settings cannot be recovered. The ***Current patient*** button (B) is not displayed.

Selecting a patient

Using the settings of the previous patient

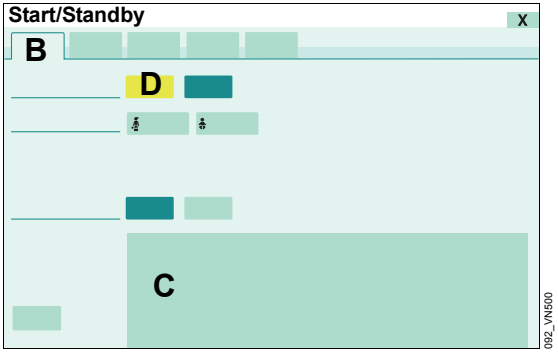
Prerequisite: The ***Start*** dialog is opened.



- Touch the ***Current patient*** button (A).

The last used patient-related settings including the alarm limits, application mode and device status are restored. O_2 monitoring and flow monitoring are switched on.

The ***Start/Standby*** page (B) is displayed. Babylog VN500 is in standby mode.



Babylog VN500 displays the ventilation parameter start-up settings (C).

The button for starting the therapy (D) is preset for 15 seconds. When the therapy is started, the settings become effective.

Admission of a new patient

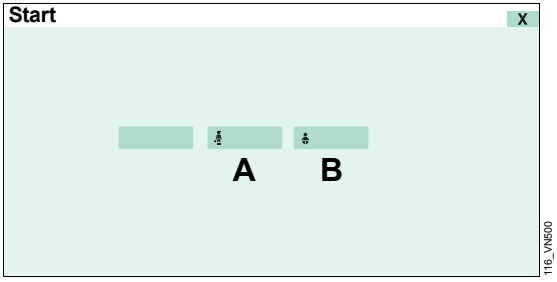
For a new patient, Babylog VN500 determines the ventilation parameters' start-up settings based on the patient category (factory setting) or the body weight. The factory settings for the settings dependent on patient category and weight can be changed in the ***System setup*** dialog window.

The patient category or the body weight can only be changed when a new patient is admitted. In the patient category ***Ped. pat.***, the body height is entered and from that the ideal body weight is determined. In the ***Neo.*** patient category, the body weight is entered directly. The weight-dependent setting for a new patient is only possible after selecting ***Weight*** in the ***System setup*** dialog window.

The alarm limit start-up settings are recalculated according to the customized system configuration.

When a new patient is admitted, the settings and trend data of the previous patient are deleted.

Prerequisite: The ***Start*** dialog is opened.



1 Touch the following button for a new patient:
   - ***New Ped. pat.*** (A) for new pediatric patients
   - ***New Neo.*** (B) for new neonatal patients

   The respective button turns yellow.

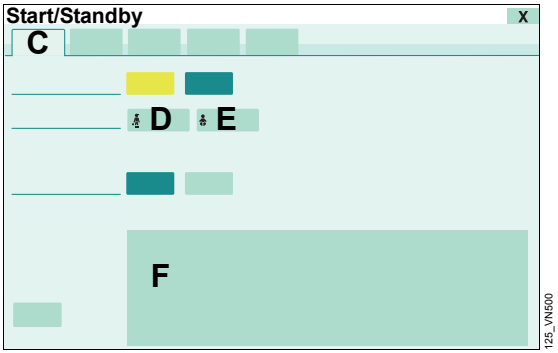
2 Confirm with the rotary knob.

The ***Start/Standby*** page is displayed. Babylog VN500 is in standby mode.

Ventilation parameter start-up settings by patient category

The ***Start/Standby*** page (C) contains the buttons for the patient category:

- ***New Ped. pat.*** (D)
- ***New Neo.*** (E)



1 Touch the button for the desired patient category (D) or (E).

2 Confirm with the rotary knob.

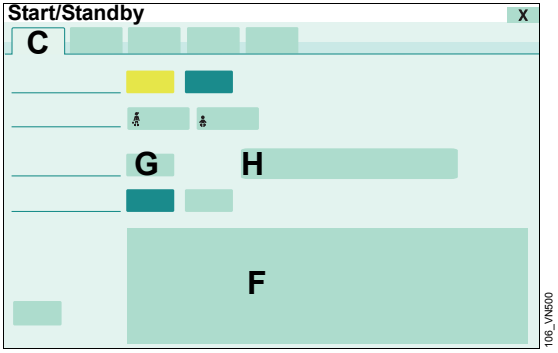
The ventilation parameters displayed in the lower part of the page (F) are the start-up settings for the selected patient category.

Determining the start-up settings can take up to 5 seconds. No entries can be made during this time.

Ventilation parameter start-up settings by body height/body weight

Prerequisite: In the ***System setup*** dialog window, the ***Weight*** function was configured and a new patient was admitted.

In the ***Ped. pat.*** patient category, the ***Start/Standby*** page (C) contains the button for body height (G) and the field for the ideal body weight (H).

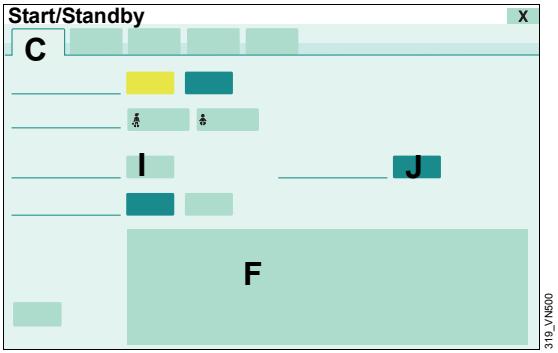


1 Touch the button for the body height (G).

2 Set the body height by turning the rotary knob and push to confirm.

Babylog VN500 determines the start-up values for ***VT***, ***RR***, ***Slope*** and ***Flow trigger*** based on the ideal body weight calculated from the body height. The values for ***VT*** and ***RR*** are displayed in the lower part of the page (F). The other ventilation parameters displayed in the lower part of the page are start-up settings for the selected patient category.

In the ***Neo.*** patient category, the patient's body weight is set directly. The ***Start/Standby*** page (C) contains the button for this start-up body weight (I).



1 Touch the button for the start-up body weight (I).

2 Using the rotary knob, set the start-up body weight and confirm the value.

The button for the current body weight (J) is displayed. After the patient has been admitted, the current body weight corresponds to the start-up body weight.

Babylog VN500 determines the start-up values for ***VT***, ***RR***, ***Slope*** and ***Flow trigger*** based on the start-up body weight. The values for ***VT*** and ***RR*** are displayed in the lower part of the page (F). The other ventilation parameters displayed in the lower part of the page are start-up settings for the selected patient category.

Determining the start-up settings can take up to 5 seconds. No entries can be made during this time.

Setting current body weight

By setting the current body weight in the ***Neo.*** patient category, it is possible to display the measured values relative to the body weight, e.g., ***VT/kg BW***. The setting is only possible during ventilation.

If the current body weight is different from the start-up body weight:

1 Touch the button for the current body weight (J).

2 Using the rotary knob, set the current body weight and confirm the value.

Whenever the patient category has been changed

Check the breathing circuit, see "Performing the breathing circuit check" on page 67.

Additional information

The configuration for the ventilation parameter start-up values by body height/body weight or by patient category is entered on the ***System setup > Ventilation > Start settings*** page. See chapter "Configuring start-up settings for the ventilation parameters" on page 150.

For information on configuring customized alarm limits, see chapter "Setting start-up values for alarm limits" on page 145.

For information on starting the therapy, see "Starting therapy" on page 71.

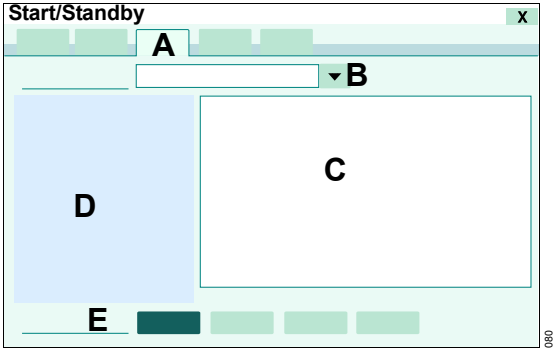
Selecting the breathing circuit and the breathing gas humidifier

The breathing circuit and the breathing gas humidifier can only be selected in standby mode.

1 Touch the ***Start/ Standby...*** button in the main menu bar.

2 Touch the ***Br. circuit/ Humidifier*** tab (A).

The page for selecting the breathing circuit and the breathing gas humidifier is displayed.



Selecting the breathing circuit from the selection list

3 Touch the ▼ button (B).

4 Select the breathing circuit used from the selection list.

5 Confirm with the rotary knob.

To help with the selection, the selected breathing circuit is displayed as a detailed representation (C) and also described as text (D).

Babylog VN500 automatically selects the corresponding humidification type based on the breathing circuit (E) selected. Some breathing circuits provide the selection of ***HME/Filter*** and ***None***.

If the breathing circuit used is not included in the selection list

1 Touch the ▼ button (B).

2 Select ***Other*** from the selection list.

3 Confirm with the rotary knob.

4 Select the humidification type (E):
- ***Active humid., exp. unheated***
- ***Active humid., exp. heated***
- ***HME/Filter***
- ***None***

Touch the corresponding button.

Using the user-defined breathing circuit

Prerequisite: The ***User-defined hose settings*** function is enabled, see page 148.

1 Touch the ▼ button (B).

2 Select ***User-defined breathing circuit*** from the selection list.

3 Confirm with the rotary knob.

4 Select the humidification type (E).

5 Perform the breathing circuit check, see page 67.

6 Save the measured values for hose compliance and hose resistance, see page 68.

Infinity ID breathing circuits

When using Infinity ID breathing circuits, the connected hose type as well as the corresponding humidification type are set automatically.

If the message ***Infinity ID breathing circuit detected.*** is not displayed when connecting an Infinity ID breathing circuit, then use a different Infinity ID breathing circuit. If the message is still not displayed, replace the Infinity ID neonatal expiratory valve or inspiratory valve.

Whenever the breathing circuit or the breathing gas humidifier have been changed:

- Check the breathing circuit, see "Performing the breathing circuit check" on page 67.

Checking readiness for operation

The system check consists of the device check and the breathing circuit check.

Safety information on the system check

WARNING

Before using on the patient

– Perform the device check. If a malfunction is detected, do not operate the device! Patient hazard!

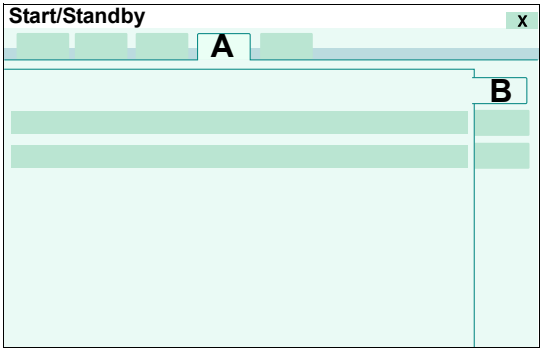
– Perform the breathing circuit check to ensure the pressure measurement accuracy. Otherwise the airway pressure may deviate from the set values.

Starting the system check

The system check is only possible in standby mode.

1 Touch the ***Start/ Standby...*** button in the main menu bar.

2 Touch the ***System check*** tab (A).



Babylog VN500 displays the date, time, and results of the last system check on the ***Overview*** page (B).

Performing the device check

The device check is only possible in standby mode.

Keep test lung ready

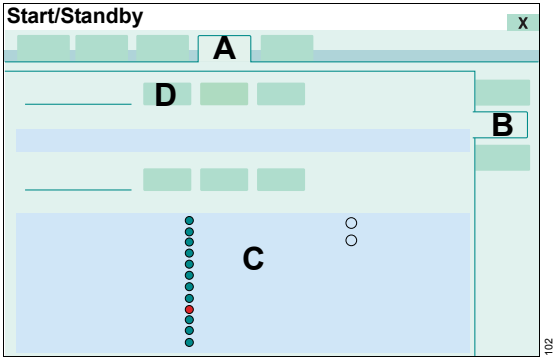
– Pediatric test lung (8409742) for the pediatric and neonatal breathing circuit

The test lung must only be inserted into the patient connector of the Y-piece after instruction by Babylog VN500.

Starting the device check

Prerequisites: The medication nebulizer is not connected. The ***System check*** page (A) is opened.

1 Touch the ***Device check*** tab (B).



Babylog VN500 displays the individual test steps in a list (C). The size of the list depends on the available applications.

2 Touch the ***Start*** button (D).

3 Confirm with the rotary knob.

Test steps in the device check

In the device check the following test steps are performed:

– Auxiliary acoustical alarm (test of auxiliary alarm/power failure alarm)
– Breathing circuit connection (visual inspection of breathing circuit)
– Inspect humidifier (visual inspection of breathing gas humidifier)
– CO_2 sensor: Zero calibration
– Neonatal flow sensor: Calibration
– Neonatal flow sensor: Measurement
– Test lung connection
– Gas supply sensors: Calibration
– O_2 supply
– Air supply
– Gas supply unit (if the gas supply unit function is activated)
– Pressure sensor calibration valve
– Expiratory valve (expiratory valve check)
– Safety valve (safety function check)
– O_2 sensor: Calibration
– Nebulizer (medication nebulizer control check)
– Ejector (functional check)

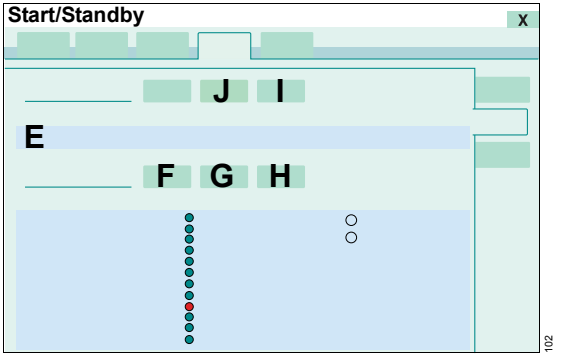
Device check procedure

Babylog VN500 guides the user in the form of a question/answer dialog through the respective test step. The instruction field (E) displays the questions or instructions how to carry out the test steps.

The questions must be answered by touching the ***Yes*** (F) or ***No*** (G) buttons.

The ***Next test*** button (H) can be used to skip the test steps.

A test step is also skipped if the necessary prerequisites have not been met.



The test steps in the device check are displayed with the following symbols:

Rotating symbol ◷	:	Active test step
Green dot	:	Correct result
Red dot	:	Incorrect result
Colorless dot	:	Test step not performed

Repeating test steps in the device check

1 Touch the ***Repeat*** button (I).

2 Confirm with the rotary knob.

All test steps that have not yet been performed or that were unsuccessful are repeated.

Aborting the device check

1 Touch the ***Cancel*** button (J).

2 Confirm with the rotary knob.

The device check is also aborted when the ***Device check*** page is exited. The device check can be continued when the ***Device check*** page is recalled.

1 Touch the ***Repeat*** button (I).

2 Confirm with the rotary knob.

Test results

The test results obtained from the device check and the calibration and zero-checking values of the sensors remain stored until the next calibration, even if the device is switched off.

Incorrect test steps and remedies

Errors in the following safety-relevant test steps generate the medium-priority alarm message ***Device check failed***:
– Pressure sensor calibration valve
– Expiratory valve
– Safety valve

The alarm cannot be acknowledged. Do not start ventilation!

Errors in non-safety-relevant test steps or test steps that are not performed on account of a prerequisite generate the low-priority alarm message ***Device check incomplete***.

The alarm causes and their remedies are displayed on the ***Current alarms*** page.

The following table shows the remedies for eliminating the errors during the device check:

Test step	**Remedy**
Auxiliary acoustical alarm	Contact DrägerService.
CO_2 sensor: Zero calibration	Check whether the CO_2 sensor is connected. Wait for the CO_2 sensor to complete its three-minute warm-up phase. Check whether the CO_2 sensor or the cuvette are soiled.
Neonatal flow sensor: Calibration	Clean the flow sensor. Keep flow sensor blocked during calibration. Check whether the flow sensor cable is connected.
Gas supply unit	Check whether the gas connection to the device is kinked. Check whether the data cable is connected. If GS500 has a separate mains plug and is running continuously, disconnect the mains plug of the gas supply unit. If GS500 does not have a separate mains plug and is running continuously, shut down and switch off Babylog VN500 (toggle switch to ◯). Contact DrägerService.

Test step	Remedy
Gas supply sensors: Calibration	Check whether the compressed gas hoses are connected. If GS500 has a separate mains plug and is switched on, disconnect the mains plug of the gas supply unit and repeat the test step. If GS500 does not have a separate mains plug and is switched on, shut down and switch off Babylog VN500 (toggle switch to ◯).
O_2 supply	Check whether the O_2 compressed gas hose is connected.
Air supply	Check whether the Air compressed gas hose is connected.
Pressure sensor calibration valve	Connect the test lung. Check the breathing circuit for leaks. Check whether the compressed gas hoses are connected. Check whether the expiratory valve is properly engaged.
Expiratory valve	Check whether the water trap is connected. Check whether the expiratory valve is properly engaged.
Safety valve	Connect the test lung. Check the breathing circuit for leaks. Check whether the compressed gas hoses are connected. Check whether the expiratory valve is properly engaged.
O_2 sensor: Calibration	Check whether the compressed gas hoses are connected.
Nebulizer	Check whether the compressed gas hoses are connected. The medication nebulizer must not be connected.
Ejector	Check whether the compressed gas hoses are connected.

- Eliminate the causes of the error and repeat the test step.
- If the test step is still incorrect, contact DrägerService.

Gas supply sensors: Calibration

The calibration of the gas supply sensors takes approximately 2 minutes. This test step must be performed every 3 months. The test step can be skipped with ***No*** and is displayed as "successfully completed" (green dot).

If the test step is skipped with ***Next test***, the test step is displayed as "not performed" (colorless dot).

If a complete calibration is necessary after 3 months and the test step is skipped with ***Next test***, the test step is displayed as "failed" (red dot).

Calibrating the O_2 sensor

The O_2 sensor is calibrated during each device check. The regular calibration of the O_2 sensor ensures the specified accuracy.

If the test step is skipped with ***Next test*** and the O_2 sensor is not calibrated for 3 months, the accuracy of the O_2 sensor will be reduced. In the parameter field for FiO_2 a question mark appears next to the measured value. After calibration during the device check the sensor will work again with full accuracy. The measured value is displayed in the parameter field.

If the test step is skipped with ***Next test***, the test step is displayed as "not performed" (colorless dot).

If Babylog VN500 requires the O_2 sensor to be calibrated and the test step is still skipped with ***Next test***, the test step is displayed as incorrect (red dot).

CAUTION

If the quality of the oxygen from the central gas supply system is not sufficient, calibrate the O_2 sensor with a corresponding calibration gas (100 % O_2). Otherwise this may result in an incorrect calibration.

After the device check

- Perform the breathing circuit check.

Performing the breathing circuit check

The check is only possible in standby mode.

The breathing circuit check must be performed after:
– device check
– changing the breathing circuit
– changing the breathing gas humidifier
– changing the patient category

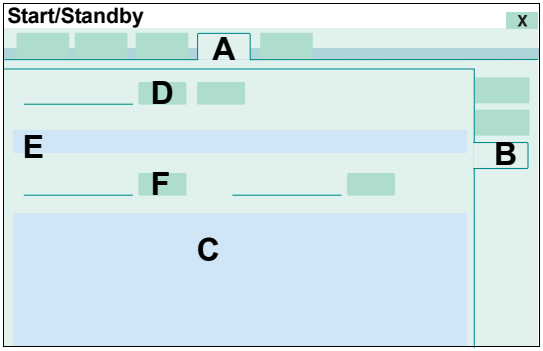
Test steps during the breathing circuit check

The following test steps are performed:
– Leakage of the breathing circuit
– Compliance of the breathing circuit
– Insp. Resistance
– Exp. Resistance

Starting the breathing circuit check

Prerequisite: The ***System check*** page (A) is opened.

1 Touch the ***Breathing circ. check*** tab (B).



The values of the last test are displayed (C). If a valid measurement has not yet taken place, the standard values are displayed.

2 Touch the ***Start*** button (D).

3 Confirm with the rotary knob.

4 When requested by Babylog VN500 in the instruction field (E): Seal the Y-piece or the neonatal flow sensor Y-piece, e.g., with a sterile glove. Confirm with ***OK*** (F).

5 When requested, open the Y-piece or remove the neonatal flow sensor Y-piece. Confirm with ***OK*** (F).

The current leakage flow is displayed continuously throughout the test. A leakage flow up to 300 mL/min at a pressure of 60 mbar (60 cmH_2O) is acceptable.

After the leak test, Babylog VN500 determines the compliance and the inspiratory and expiratory resistance of the breathing circuit.

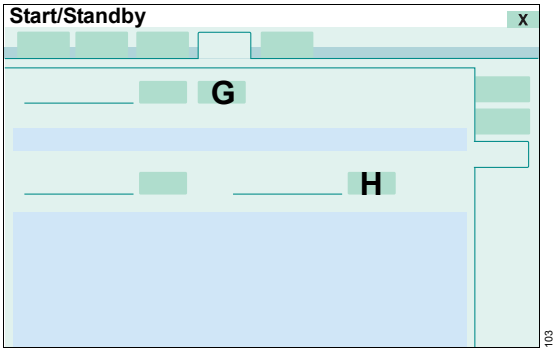
When changing the breathing circuit and type of humidifier, Babylog VN500 automatically resets the values for hose compliance and hose resistance to default values. When using Infinity ID breathing circuits, the default values of the breathing circuit detected are used. The leakage measurement becomes invalid.

When the patient category is changed, the breathing circuit that was last used in this category is selected and the corresponding values for hose compliance and hose resistance are used.

The leakage measurement becomes invalid when a new patient is admitted to the same patient category. The values for hose resistance and hose compliance are retained.

It is recommended to perform the breathing circuit check before commencing patient ventilation with a newly started device.

Aborting the breathing circuit check



1 Touch the ***Cancel*** button (G).

2 Confirm with the rotary knob.

The leakage measurement becomes invalid. The values for hose resistance and hose compliance are reset to the default values.

Repeating the breathing circuit check

If the breathing circuit is changed after the breathing circuit check, the humidification type or the patient category is changed, the breathing circuit check will have to be repeated.

The breathing circuit check is also necessary when using Infinity ID breathing circuits.

User-defined breathing circuit

Prerequisite: The user-defined breathing circuit has been selected, see page 62.

The values for hose resistance and hose compliance can be saved and are then available when that breathing circuit is selected again.

- Touch the ***Save*** button (H).

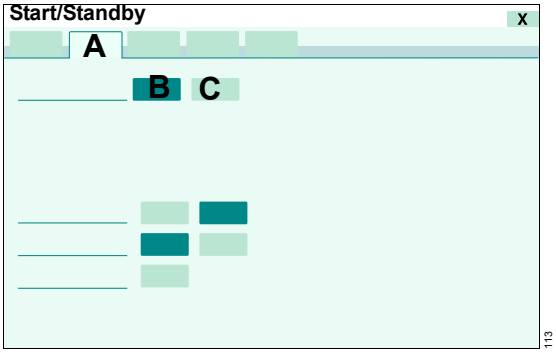
Selecting the Tube or NIV application mode

Babylog VN500 can change between non-invasive ventilation and tube ventilation.

The application mode can only be selected in standby mode.

1 Touch the ***Start/ Standby...*** button in the main menu bar.

2 Touch the ***Tube/NIV*** tab (A).



3 Touch the ***Tube*** (B) or ***NIV*** (C) button.

4 Confirm with the rotary knob.

Observe the information on changing the application mode!

CAUTION

Application mode ***NIV*** must not be activated with intubated patients.

WARNING

Alarm limits and ventilation settings must be checked or set again in order to ensure complete monitoring of ventilation after changing from *NIV* application mode to *Tube* application mode.

Additional information

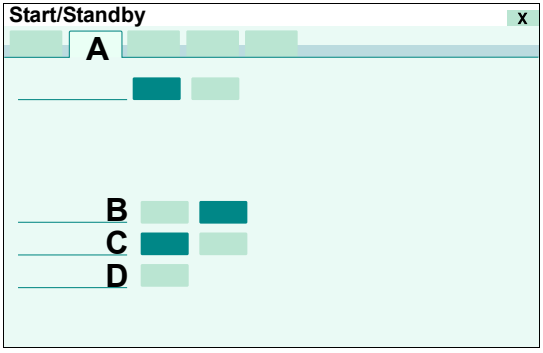
For information on using the ***NIV*** application mode for non-invasive ventilation, see "NIV – Non-invasive ventilation" on page 81.

Setting parameters for the tube

The inner diameter of the tube and the tube type can be entered for the following functions:
– Display of ***Ptrach***, independent of ATC,
– Measurement of patient resistance ***Rpat*** and of the index ***C20/Cdyn***.

When the inner diameter of the tube and the tube type are entered, the measured value corresponds with the patient resistance ***Rpat***. Only when the inner diameter of the tube and the tube type are entered correctly, ***Rpat*** and ***C20/Cdyn*** are displayed correctly. The measured value ***R*** always corresponds with the total resistance.

Prerequisite: The ***Tube/NIV*** page (A) is opened. The ***Tube*** application mode has been selected.



Activating or deactivating the calculation of tracheal pressure

1 Touch the appropriate button (B).

2 Confirm with the rotary knob.

If ATC is switched off, the calculation of tracheal pressure is always deactivated when a new patient is admitted.

Selecting the tube type

In the ***Neo.*** patient category, this selection is not available.

1 Touch the appropriate button (C).

2 Confirm with the rotary knob.

Entering the inner diameter of the tube

1 Touch the (D) button.

2 Set the value by turning the rotary knob and push to confirm.

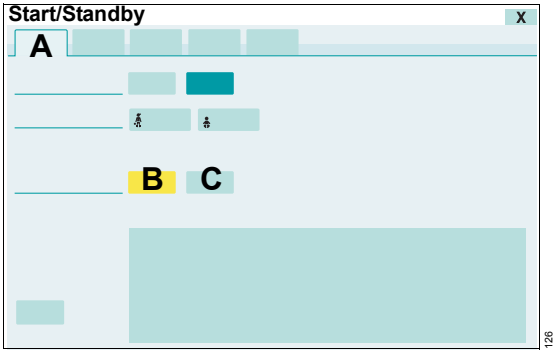
Selecting the therapy type

Babylog VN500 can choose between the therapy types ***Ventilation*** and ***O2 Therapy***.

The therapy type can only be changed in standby mode.

1 Touch the ***Start/ Standby...*** button in the main menu bar.

The ***Start/Standby*** page (A) is displayed.



2 Touch the ***Ventilation*** (B) or ***O2 Therapy*** (C) button.

3 Confirm with the rotary knob.

Additional information

"O2 therapy" on page 99.

"Setting ventilation" on page 74.

Starting therapy

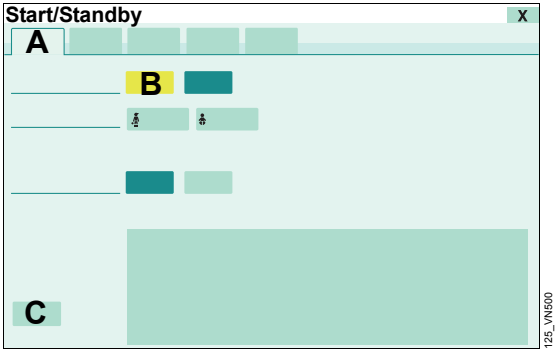
Before using on the patient

- Carry out a system check to ensure that Babylog VN500 is operating correctly, see page 63.
- Check the therapy settings: Setting the alarm limits, see page 110. Setting ventilation modes and ventilation parameters, see "Setting ventilation" on page 74.

Starting ventilation or O_2 therapy

1 Touch the ***Start/ Standby...*** button in the main menu bar.

The ***Start/Standby*** page (A) is displayed. The ***Start*** button (B) remains preset for 15 seconds.



2 Confirm with the rotary knob.

Babylog VN500 starts the therapy with the set ventilation parameters. The main page for ventilation or O_2 therapy is displayed.

When the *Start* button is no longer preset

After 15 seconds the ***Start*** button is no longer preset.

1 Touch the ***Start*** button (B).

2 Confirm with the rotary knob.

Additional information

The page for the ventilation settings can be opened with the ***Ventilation settings...*** button (C).

Displaying the status of accessories

1 Touch the ***Start/ Standby...*** button in the main menu bar.

2 Touch the ***Accessory status*** tab.

Babylog VN500 displays the time until it is recommended to exchange the accessories.

Sterilization of the expiratory valve or inspiratory valve may gradually impair the operation of RFID transmission. This may mean that Infinity ID breathing circuit functions may not work or may no longer work reliably. The status for the Infinity ID accessories is not displayed.

Additional information

The time for the exchange interval can be configured on the ***System setup > Exchange intervals*** page. See "Exchange intervals" on page 159.

Operation

Setting ventilation

Overview

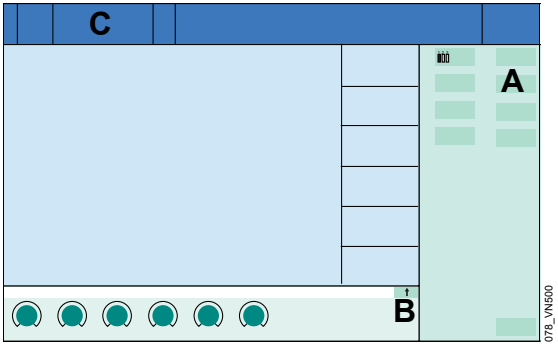
This chapter describes how to set ventilation modes and general settings as well as additional settings for ventilation parameters.

For a detailed description of the ventilation modes and ventilation parameters, see chapters "Description of the ventilation modes" on page 244 and "Additional settings for ventilation" on page 257.

Opening the *Ventilation settings* dialog window

The ***Ventilation settings*** dialog window can be opened as follows:

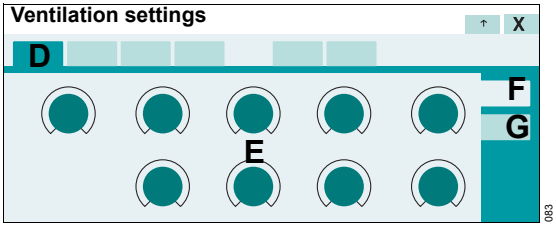
- Touch the ***Ventilation settings...*** button (A) in the main menu bar.
- Touch the ↑ button (B) in the therapy bar.
- Touch the displayed ventilation mode (C) in the header bar.



Babylog VN500 opens the ***Ventilation settings*** dialog window.

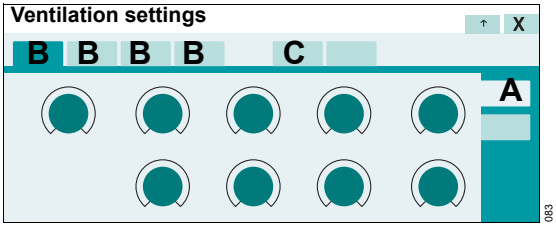
The page for the active ventilation mode (D) with the ***General settings*** (F) appears by default. The corresponding therapy controls (E) are displayed.

The tab for ***Additional settings*** (G) can be used to supplement the active ventilation mode with additional settings.



Selecting ventilation modes

Prerequisite: The ***General settings*** page (A) is opened.



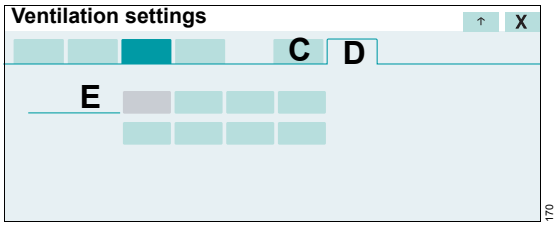
The ***Ventilation settings*** dialog window contains 5 tabs for selecting the ventilation modes. 4 tabs (B) have ventilation modes permanently assigned to them. The fifth tab (C) can be used to select another ventilation mode, which can be selected from the available ventilation modes.

The following 4 ventilation modes are preset at the factory:
- PC-CMV
- PC-AC
- PC-SIMV
- PC-PSV

For information on changing the assignment of ventilation modes, see "Configuring start-up settings for the ventilation modes" on page 149.

Selecting an additional ventilation mode in the dialog window

1 Touch the ***Other modes*** tab (D).



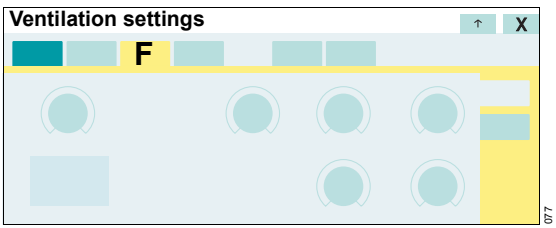
All the available ventilation modes (E) are displayed.

2 Touch the button for the corresponding ventilation mode. The color of the tab (D) turns yellow.

3 Confirm with the rotary knob.

The additional ventilation mode is displayed in the fifth tab (C). The ventilation mode is active.

Changing the ventilation mode



1 Touch the corresponding tab, e.g., (F). The color of the tab turns yellow.

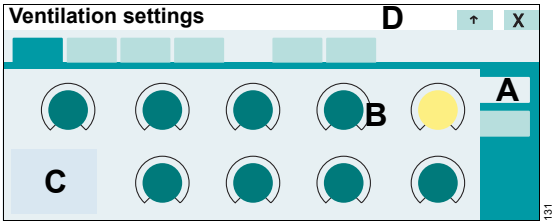
2 Preset the ventilation parameters if necessary.

3 Confirm with the rotary knob. The color of the tab turns dark green.

The ventilation mode is active. The settings are applied to the patient.

Setting ventilation parameters

Prerequisite: The ***General settings*** page (A) is opened.



1 Touch the corresponding therapy control, e.g., (B).

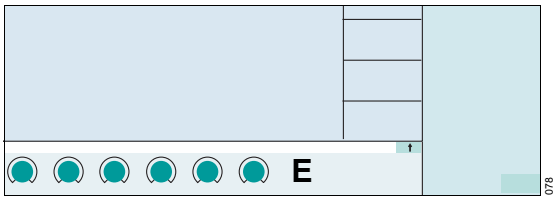
2 Set the value by turning the rotary knob and push to confirm.

The additional ventilation parameters derived from the ventilation parameter are calculated by Babylog VN500 and displayed in the setting assistance field (C).

Information is displayed in the message field (D), e.g., when the setting limit of a parameter has been reached.

Setting ventilation parameters in the therapy bar

The ventilation parameters of the active ventilation mode can also be set with the therapy controls in the therapy bar (E).



Additional information

"Exceeding the set limit of a ventilation parameter" on page 34.

"Direct setting of ventilation parameters (QuickSet)" on page 35.

"Linked setting of ventilation parameters"
on page 35.

General settings for ventilation

The general settings for the ventilation parameters are listed in the following tables:
– Pressure-controlled ventilation modes
– Spontaneous breathing support

WARNING

If flow measurement is deactivated for SPN-CPAP, use a separate monitoring device.

CAUTION

Only remove the water trap of the expiratory valve briefly during ventilation. Otherwise, ventilation will be impaired.

Pressure-controlled ventilation modes

Ventilation parameters	Ventilation mode					
	PC-SIMV	**PC-AC**	**PC-CMV**	**PC-APRV**	**PC-MMV**	**PC-PSV**
FiO_2	X	X	X	X	X	X
VT	X[1)]	X[1)]	X[1)]		X	X[1)]
Ti	X	X	X		X	
RR	X	X	X		X	X
Slope or Insp. flow[2)]	X	X	X	X	X	X
Pmax	X[3)]	X[3)]	X[3)]	X[3)]	X[3)]	X[3)]
Pinsp	X[4)]	X[4)]	X[4)]			X[4)]
PEEP	X	X	X		X	X
ΔPsupp	X				X	
Timax						X[5)]
Thigh				X		
Tlow				X[6)]		
Phigh				X		
Plow				X		
Tlow max				X[7)]		
Exp. term.				X[7)]		

1) if ***VG*** is switched on
2) depending on configuration ***Slope adjustment***
3) if ***Pmax/Paw high autoset*** is activated and ***ATC*** or ***Apnea Ventilation*** or ***VG*** is switched on
4) if ***VG*** is switched off
5) in the ***Neo.*** patient category in the ***Tube*** application mode, or in the ***Ped. pat.*** patient category in the ***NIV*** application mode
6) if ***AutoRelease*** is switched off
7) if ***AutoRelease*** is switched on

Spontaneous breathing support

Ventilation parameters	Ventilation mode			
	SPN-CPAP/PS	**SPN-CPAP/VS**	**SPN-CPAP[1)]**	**SPN-PPS**
FiO_2	X	X	X	X
VT		X		
VTmax				X
Timax	X[2)]	X[2)]		X[2)]
Slope or Insp. flow[3)]	X	X	X	
Pmax	X[4)]	X[4)]		X[4)]
PEEP	X	X	X	X
ΔPsupp	X			
Vol. Assist				X
Flow Assist				X
TmanInsp			X	
PmanInsp			X	

1) only available in the ***Neo.*** patient category in the ***NIV*** application mode
2) in the ***NIV*** application mode or in the ***Neo.*** patient category
3) depending on configuration ***Slope adjustment***
4) if ***Pmax/Paw high autoset*** is activated

Additional settings for ventilation

Overview of possible supplementary settings

The ventilation modes can be combined with additional settings to optimize ventilation. The table shows the possible additional settings for the respective ventilation mode.

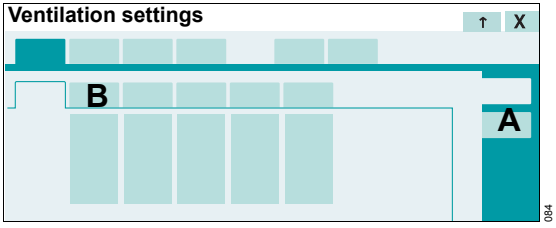
Ventilation mode	Additional settings					
	Apnea Ventilation	Trigger	Sigh	ATC	Volume Guarantee	Auto Release
PC-CMV			X	X	X	
PC-AC		X	X	X	X	
PC-SIMV	X	X	X	X	X	
PC-PSV		X	X	X	X	
PC-MMV		X	X	X	X	
PC-APRV	X			X		X
SPN-CPAP/PS	X	X		X		
SPN-CPAP/VS	X	X		X		
SPN-PPS	X	X		X		

Setting the supplementary settings

Prerequisite: The page with the active ventilation mode is open.

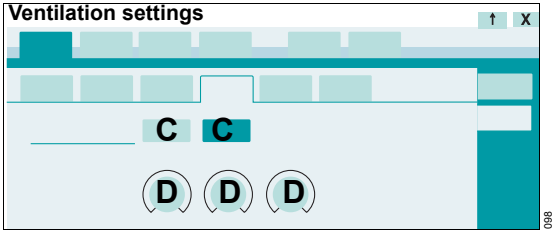
1 Touch the ***Additional settings*** tab (A).

The additional settings of the active ventilation mode are displayed.



2 Touch the tab of the respective additional setting (B).

The page for setting the corresponding parameters is opened.



3 Use the buttons (C) to activate or deactivate the additional setting.

4 Touch the corresponding therapy control (D).

5 Set the value by turning the rotary knob and push to confirm.

The ***Trigger*** and ***Apnea Ventilation*** additional settings can be configured as buttons in the main menu bar to enable direct access. See "Assigning functions to additional buttons" on page 142.

Ventilation parameters for the additional settings

CAUTION
High trigger sensitivity may lead to auto-triggering of the ventilator.

Additional settings	Ventilation parameters	Dependencies, information
Apnea Ventilation	On/Off	
	VTapn	
	RRapn	
	Pmax	If ***Pmax/Paw high autoset*** is configured
	PEEP	In PC-APRV
	Flow trigger	In PC-APRV
	Slope	In SPN-PPS
		For configuration of the ***Automatic return from Apnea Ventilation*** function, see "Configuring general settings" on page 154. Description, see "Automatic return from apnea ventilation" on page 258.
Trigger	Flow trigger	
Sigh	On/Off	
	∆intPEEP	
	Interval sigh	
	Cycles sigh	
ATC	On/Off	See chapter "Configuration" on page 137
	Tube type (ET/Trach.)	Only available in the ***Ped. pat.*** patient category
	Tube Ø	Inner diameter of the tube
	Compens.	Degree of compensation: ***Compens.*** = 100 % – airway pressure regulation to the tracheal level
	Pmax	If ***Pmax/Paw high autoset*** is configured
Volume Guarantee	On/Off	See chapter "Configuration" on page 137
	VT	
	Pmax	If ***Pmax/Paw high autoset*** is configured
	Pinsp	If VG is switched off

continued next page

Additional settings	Ventilation parameters	Dependencies, information
AutoRelease	On/Off	
	Exp. term.	
	Tlow	If AutoRelease is switched off
	Tlow max	If AutoRelease is switched on

Additional information

For a detailed description of the additional settings, see chapter "Additional settings for ventilation" on page 257.

NIV – Non-invasive ventilation

Overview

Babylog VN500 can be used for the ventilation of intubated patients (application mode ***Tube***) and for non-invasive ventilation (application mode ***NIV***).

This chapter describes the use of non-invasive ventilation in the ***NIV*** application mode.

The following ventilation modes can be selected in the ***NIV*** application mode:

Ventilation mode	Patient category	
	Ped. pat.	Neo.
PC-CMV	X	X
PC-AC	X	
PC-SIMV	X	
PC-PSV	X	
PC-MMV	X	
PC-APRV	X	
SPN-CPAP		X
SPN-CPAP/PS	X	
SPN-CPAP/VS	X	
SPN-PPS	X	

Safety information when using NIV

CAUTION

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

CAUTION

Use of masks increases the dead space. Observe the mask manufacturer's instructions!

NOTE

Use suitable masks and prongs. Otherwise excessive leakages may occur.

WARNING

Avoid high airway pressures. Danger of aspiration!

WARNING

Alarm limits and ventilation settings must be checked or set again in order to ensure complete monitoring of ventilation after changing from *NIV* application mode to *Tube* application mode.

Automatic tube compensation (ATC) which is activated in ***Tube*** application mode is ineffective in ***NIV*** application mode.

Selecting the *NIV* application mode

The application mode can only be selected in standby mode.

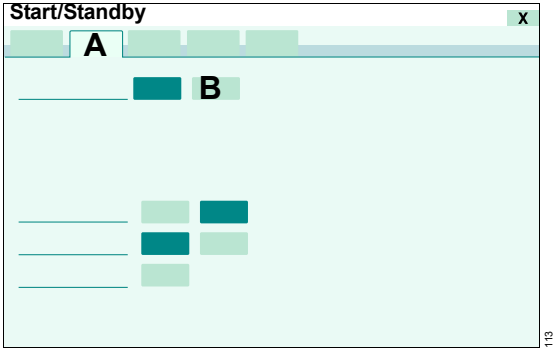
1 Touch the ***Start/ Standby...*** button in the main menu bar.

Babylog VN500 opens the ***Start/Standby*** dialog window. The ***Start/Standby*** page appears by default.

2 Touch the ***Standby*** button and confirm with the rotary knob.

Babylog VN500 is in standby mode.

3 Touch the ***Tube/NIV*** tab (A).



4 Touch the ***NIV*** button (B) and confirm with the rotary knob.

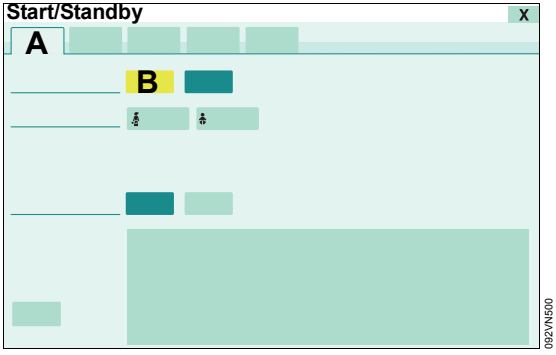
Babylog VN500 is in ***NIV*** application mode. Babylog VN500 displays the NIV symbol in the header bar.

In the ***Neo.*** patient category, flow monitoring is deactivated.

Starting NIV ventilation

Prerequisite: The ***Start/Standby*** dialog window is opened.

1 Touch the ***Start/Standby*** tab (A).



The ***Start*** button (B) remains preset for 15 seconds.

2 Confirm with the rotary knob.

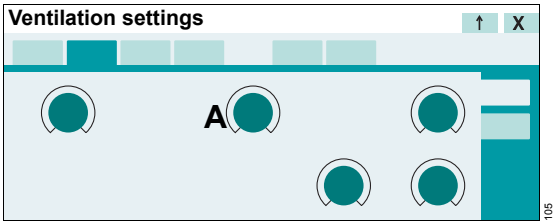
Babylog VN500 starts the therapy with the set ventilation parameters. The main screen for ventilation is displayed.

Setting ventilation parameters for NIV

- Set the ventilation parameters as described under "Setting ventilation parameters" on page 75.

Therapy control Timax

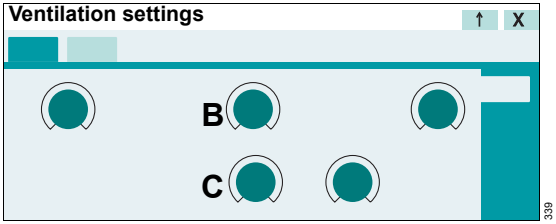
The therapy control ***Timax*** (A) limits the maximum duration of supported breaths (Pressure Support, Volume Support, PPS) because the inspiratory termination criterion may be ineffective with very high leakages.



- Set the value for ***Timax*** by turning the rotary knob and push to confirm.

Therapy controls *TmanInsp* and *PmanInsp*

Prerequisite: The ***Neo.*** patient category and the ***SPN-CPAP*** ventilation mode are set.



During manual inspiration, the duration of the mandatory breath is determined by the ***TmanInsp*** therapy control (B).

During manual inspiration, the pressure of the mandatory breath is determined by the ***PmanInsp*** therapy control (C).

- Set and confirm the relevant values using the rotary knob.

Monitoring during NIV

- Use additional monitoring, e.g., external SpO_2, if necessary.

A time-lag ***Tdisconnect*** between 0 and 60 seconds can be set for the lower alarm limit of the airway pressure.

Additional information

"Setting alarm limits" on page 110.

Displaying curves and measured values

Overview

This chapter describes how curves and measured values are displayed on the main screen as well as how to change the screen views during operation.

Changing the screen view

Babylog VN500 displays a preconfigured view on the main screen.
3 views can be grouped together specifically for the hospital concerned in the ***System setup*** dialog window.

Displaying other views

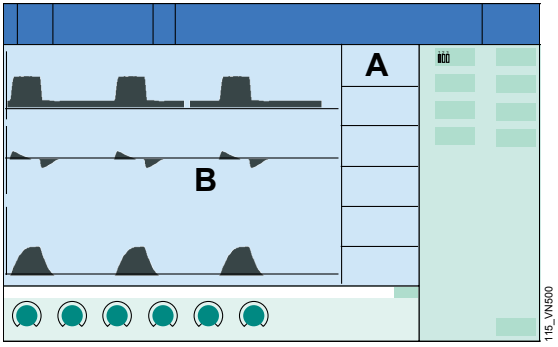
- Touch the ***Views...*** button in the main menu bar.

The screen displays the second view.

- Touch the ***Views...*** button.

The screen displays the third view.

Changing the display of monitoring fields



The parameters can be displayed in parameter fields (A) and in the curve field (B).

The fields can be standard or double in size. The information that can be displayed depends on the size of the fields:

Parameter fields

Standard size	Single parameter
	Two parameters
	Short trend for measured values
	Short trend for setting values
Double size	Single parameter
	Parameter group
	Loop
	Short trend for measured values
	Short trend for setting values

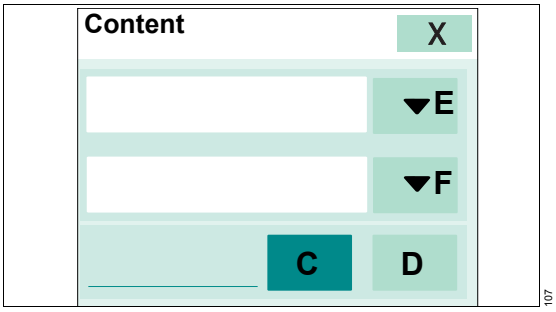
Curve fields

Standard size	Single curve
	Trend for measured values
	Trend for setting values
	Tabular trend
	Multi-trend
	Alarm history
Double size	Single curve
	Single loop
	Double loops
	Trend for measured values
	Trend for setting values
	Tabular trend
	Multi-trend
	Alarm history
	Lung display (Smart Pulmonary View)

Selecting the display of parameter fields

1 Touch the parameter field.

The selected parameter field is marked. Babylog VN500 opens the dialog for the contents of the parameter field.



Selecting the field size

2 Touch the ***1x*** button (C) for standard size or ***2x*** (D) for double size.

Selecting the display format

3 Touch the (E) button.

The selection list for the display of parameters is displayed according to the selected size of the parameter field.

4 Select the display format and confirm with the rotary knob.

Selecting the parameter

5 Touch the (F) button.

The selection list for the displayable parameters is displayed.

6 Select the parameter and confirm it with the rotary knob.

Closing the dialog

7 Touch the ***X*** button. The dialog is closed.

Selecting the display of curve fields

1 Touch the curve field.

The selected curve field is marked. Babylog VN500 opens the dialog for the contents of the curve field.

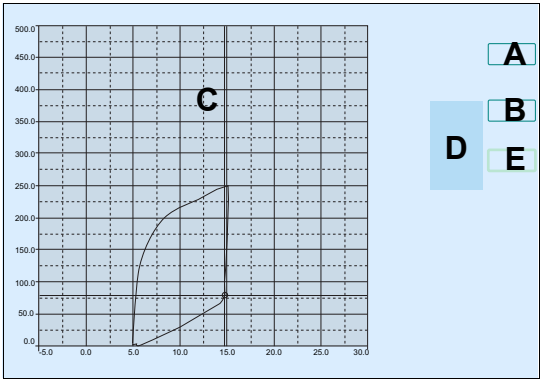
2 Proceed as described under "Selecting the display of parameter fields".

Additional information

"Configuring the screen view" on page 140.

"Factory-set screen views" on page 281.

Evaluating loops



Displaying a reference loop

- Touch the ***Ref.*** button (A).

A loop is recorded and displayed as a reference loop.

The date and the time of the loop appear beside the button (A). The reference loop is drawn in black. The reference loop remains displayed until the ***Ref.*** button (A) is touched again.

Recording the current loop in order to freeze, display and save it afterwards

- Touch the ***Capture loop*** button (B).

The current loop is frozen. The loops are drawn in blue. After "freezing", a cursor (C) is displayed which can be moved with the rotary knob. The respective values are displayed (D).

Recording up to 10 loops of automatic or spontaneous breaths

1 Touch the ***Draw*** button (E).

2 Set how many loops should be recorded with the rotary knob and push to confirm.

The set number is displayed in the button.

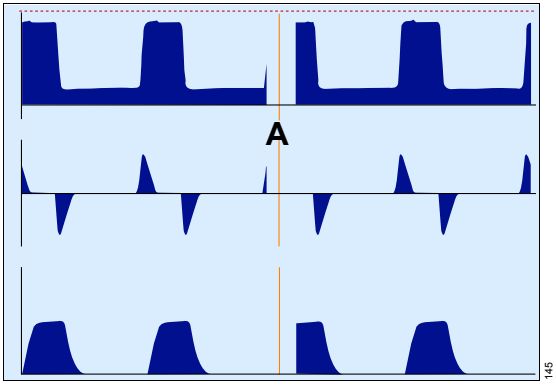
Additional information

A grid only appears if loops are displayed in the complete curve field.

Freeze waveforms

The ***Freeze waveforms*** function can be configured as a button in the main menu bar to enable direct access. See "Assigning functions to additional buttons" on page 142.

- Touch the ***Freeze waveforms*** button in the main menu bar.



The current curves are immediately frozen. The cursor (A) displays the time of "freezing" and the value at the cursor position.

To display a measured value at a certain moment in time:

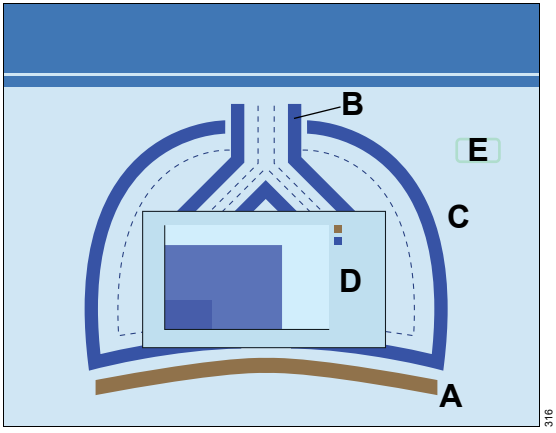
- Position the cursor on the time with the rotary knob.

The measured value or the measured value pair are displayed above the curve.

Smart Pulmonary View

Smart Pulmonary View is a graphic display of the compliance and resistance as well as of the spontaneous and mandatory minute volume.

A double-size curve field must be configured in order to display Smart Pulmonary View. See "Configuring the screen view" on page 140.



A The movement of the diaphragm indicates synchronized mandatory breaths, supported (triggered) breaths, or spontaneous breaths.

B The blue line around the trachea indicates the resistance ***Rpat***. The higher the resistance, the thicker the line. The value is also displayed.

C The blue line around the lungs indicates the compliance ***Cdyn***. The higher the compliance, the thinner the line. The value is also displayed.

D Diagram displaying the relationship between spontaneous breathing and mandatory ventilation. The following parameters are displayed in different colors:
- ***VTspon*** and ***RRspon***
- ***VTmand*** and ***RRmand***

Smart Pulmonary View must be calibrated for each new patient. If the measured values for ***Rpat*** and ***Cdyn*** are outside the current display range, a red line appears and calibration is required.
Babylog VN500 displays the following information: ***Touch "Take reference".***

Calibrating Smart Pulmonary View:

- Touch the ***Take reference*** button (E).

The display range is adapted to the current measured values. The measured values from the last calibration are displayed as a broken line.

Additional information

For a detailed description, see "Smart Pulmonary View" on page 269.

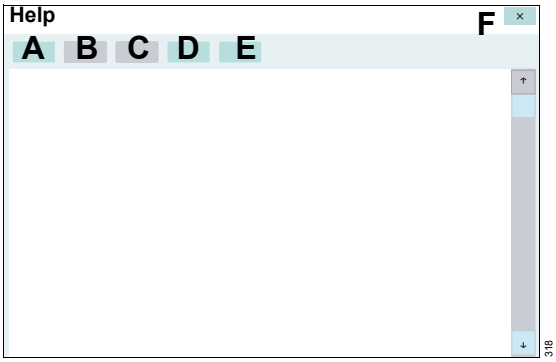
Help

WARNING
Risk of operating error.
The *Help* function is not a substitute for the Instructions for Use. The Instructions for Use must be observed to ensure safe operation.

The ***Help*** function can be configured as a button in the main menu bar to enable direct access. See "Assigning functions to additional buttons" on page 142.

Opening Help

- Touch the ***Help...*** button in the main menu bar.



The following buttons are available in the ***Help*** dialog window:
– ***Home*** (A) to open the start page
– ← (B) to scroll back
– → (C) to scroll forward
– ***Content*** (D) to open the table of contents
– ***Index*** (E) to open the index

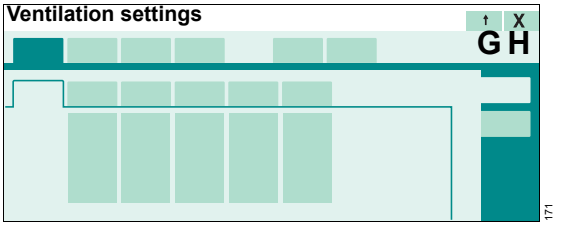
- Touch the appropriate button.

Closing Help

- Touch the (F) button.

Opening Help in the dialog window

The Help function can also be opened in the following dialog windows:
– ***Ventilation settings***
– ***Special maneuvers > Nebulization***
– ***Special maneuvers > Maneuvers***



- Touch the ↑ button (G) in the relevant dialog window.

The appropriate section of the Help is displayed.

Closing Help

- Touch the ↓ (G) or the (H) button in the relevant dialog window.

Special maneuvers

Overview

Babylog VN500 provides the following maneuvers in the ***Special maneuvers > Maneuvers*** dialog window:

– Manual inspiration – Manual inspiration/hold

– Oxygen enrichment for suction maneuver

Manual inspiration – Manual inspiration/hold

The ***Manual inspiration/hold*** maneuver can be activated in all ventilation modes and offers the following options:

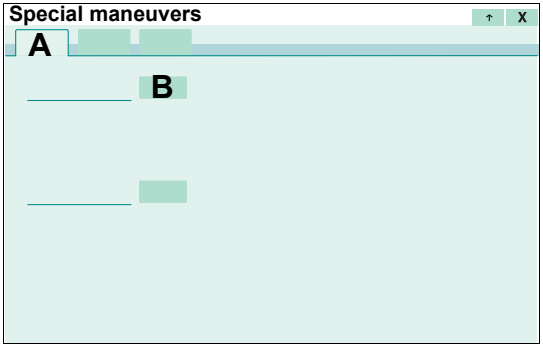
– Between two automatic breaths, a breath can be manually started and held. The pattern of the manually started breath corresponds to the ventilation pattern of the currently active automatic ventilation mode.

– Regardless of the start time, an automatic breath can be prolonged.

1 Touch the ***Special maneuvers...*** button in the main menu bar.

Babylog VN500 opens the ***Special maneuvers*** dialog window.

2 Touch the ***Maneuvers*** tab (A) if the page is not already preset.



Triggering manual inspiration

- Briefly touch the ***Man. insp./hold*** button (B).

Manually extending inspiration

- Touch and **hold** the ***Man. insp./hold*** button (B) for the desired inspiratory time.

Babylog VN500 triggers an extended breath or extends an already triggered automatic breath.

Babylog VN500 automatically ends inspiration:
– After a maximum of 40 seconds in the ***Ped. pat.*** patient category
– After a maximum of 5 seconds in the ***Neo.*** patient category

WARNING

The *Manual inspiration/hold* maneuver must not be used during endotracheal suction. Otherwise negative pressure may jeopardize the patient.

Additional information

The ***Manual inspiration/hold*** maneuver can be configured as a ***Man. insp./hold*** button in the main menu bar to enable direct access. See "Assigning functions to additional buttons" on page 142.

Oxygen enrichment for suction maneuver

Overview

To avoid any risk of hypoxia during endotracheal suction, Babylog VN500 offers a program for oxygen enrichment.

The O_2 concentration is increased to the current inspiratory O_2 concentration, multiplied by a factor. The factor can be configured, see page 155.

After the oxygen enrichment program is started, Babylog VN500 ventilates the patient for an initial oxygen enrichment phase of max. 180 seconds with an increased O_2 concentration. During this time, Babylog VN500 waits for a disconnection.

When the device is disconnected for suction, Babylog VN500 interrupts ventilation. During the suction phase, the acoustic alarms are suppressed so that the suction maneuver is not disturbed.

After suction and automatically recognized reconnection, Babylog VN500 delivers an increased O_2 concentration for the final oxygen enrichment phase of 120 seconds.

During suction and for 120 seconds afterwards, the lower alarm limit for the minute volume is switched off.

Initial and final oxygen enrichment are only possible with a fully functioning flow sensor and if flow monitoring is switched on!

WARNING

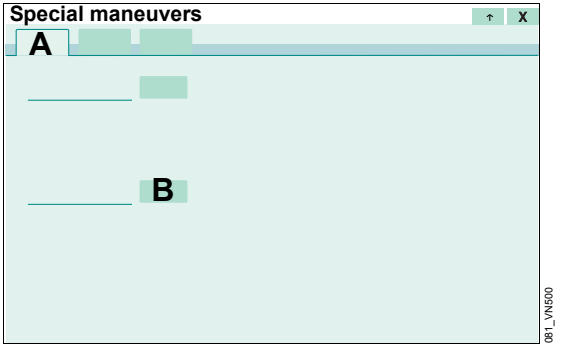
Select an appropriate suction catheter for suction. Otherwise this may result in a too high negative pressure.

Before suction

1 Touch the ***Special maneuvers...*** button in the main menu bar.

Babylog VN500 opens the ***Special maneuvers*** dialog window.

2 Touch the ***Maneuvers*** tab (A) if the page is not already preset.



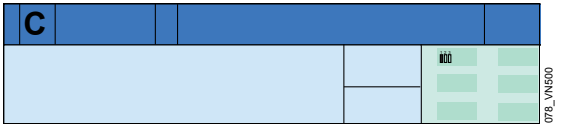
3 Touch the ***O_2 suction*** button (B) and confirm with the rotary knob.

The oxygen enrichment program is started.

Babylog VN500 continues ventilating in the set ventilation mode with an increased O_2 concentration:
1 to 2 times the current FiO_2 concentration

If PEEP is not set to more than 4 mbar (4 cmH_2O), PEEP will be applied automatically at 4 mbar (4 cmH_2O). This PEEP allows Babylog VN500 to detect any subsequent disconnection. The other ventilation parameters remain unaffected.

Screen display:



The field (C) in the header bar continuously displays the initial oxygen enrichment phase with the remaining time in seconds.

Initial oxygen enrichment lasts for a maximum of 180 seconds. During this time Babylog VN500 waits for a disconnection for suction. The oxygen enrichment program is terminated by Babylog VN500 if there is no disconnection after the 180 seconds have elapsed.

After disconnection for suction, Babylog VN500 delivers a minimal flow for the duration of disconnection in order to detect automatically the end of the disconnection phase. 120 seconds are available for suctioning. In the header bar, the disconnection phase with the remaining time available for suction is displayed continuously in seconds (C). If suction is ended and the system is reconnected within the displayed time, Babylog VN500 terminates the disconnection phase.

Automatic termination of oxygen enrichment

If there is no reconnection when the available time (120 seconds) has elapsed, the oxygen enrichment program is terminated. All alarms are immediately reactivated. Babylog VN500 immediately continues ventilating in the set ventilation mode.

After reconnection

After reconnection, Babylog VN500 continues ventilating in the set ventilation mode, except that for 120 seconds a correspondingly increased O_2 concentration will continue to be delivered for final oxygen enrichment.

In the header bar, the remaining time available for the final oxygen enrichment phase is displayed continuously in seconds.

Terminating oxygen enrichment prematurely

- Touch the ***O_2 suction*** button again and confirm with the rotary knob.

Additional information

The suction maneuver can be configured as a ***O_2 suction*** button in the main menu bar to enable direct access. See "Assigning functions to additional buttons" on page 142.

Medication nebulization

Safety information on medication nebulization

WARNING

Flammable agents must not be nebulized! They may be ignited by the glowing flow sensor.

CAUTION

During medication nebulization, do not use a heat and moisture exchanger (HME) at the Y-piece. The medication will not be appropriately administered to the patient.

CAUTION

Do not place a bacterial filter on the nebulizer outlet during nebulization! Bacterial filters may increase the flow resistance and impair ventilation.

CAUTION

Remove the medication nebulizer after use. Accidental medication nebulization may impair ventilation.

CAUTION

Surplus nebulized medication can affect the ambient air.

CAUTION

If no pneumatic medication nebulizer is connected, switch off the nebulization function. Otherwise, Babylog VN500 will deliver a too low tidal volume.

NOTE

Aerosols can impair the proper functioning of the expiratory valve. When using medication nebulization, shorten the reprocessing cycles for the expiratory valve.

Failure of the Air supply

If the Air supply fails during medication nebulization, operation of the medication nebulizer continues with 100 Vol% O_2. Deviations in the inspiratory O_2 concentration are possible.

Air supply from the gas supply unit GS500

If Babylog VN500 is supplied with Air from the gas supply unit GS500 and O_2 is supplied from the central gas supply system, the medication nebulizer operates with O_2 only. The measured value ***FiO2*** indicates the O_2 concentration of the gas supplied at the inspiratory port and not the O_2 concentration administered to the patient. For deviations, see page 268.

Using a pneumatic medication nebulizer

When ***Insp. flow*** parameter has been configured instead of the ***Slope*** parameter, 30 % of the set inspiratory time ***Ti*** is automatically used during nebulization as the pressure rise time. Configuring the parameter ***Slope*** for a direct setting, see page 154. When a ventilation mode is active for which the inspiratory time ***Ti*** cannot be set, 0.1 s is used as the slope.

The medication nebulizer nebulizes continuously. The aerosol generated during expiration does not reach the lungs, however.

If Babylog VN500 is supplied with Air and O_2 from the central gas supply system, the medication nebulizer is operated with mixed gas at the set O_2 concentration. Small deviations in the inspiratory O_2 concentration of up to ±4 Vol% are possible. For respiratory rates above 12/min, refer to the graph on page 268.

In order to avoid false alarms and ensure monitoring:

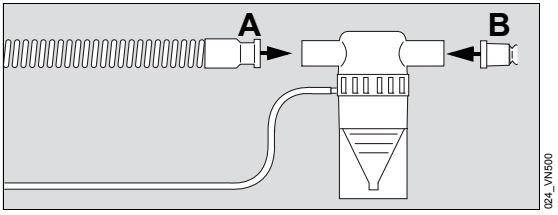
- Use additional monitoring, e.g., external SpO_2, if necessary.

Preparing the pneumatic medication nebulizer

CAUTION
In order to ensure limitation of the nebulizer flow, only use pneumatic medication nebulizer 8411030.

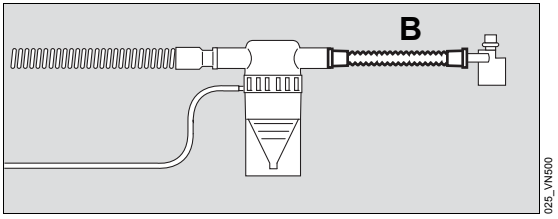
- Prepare the medication nebulizer in accordance with the corresponding Instructions for Use.

Connecting the medication nebulizer to the breathing circuit



1 Remove the corrugated hose for the breathing circuit (A) from the inspiratory port of the Y-piece and connect it to the inlet port of the medication nebulizer.

2 Fit the corrugated hose (B), length 0.13 m (5.1 in), to the outlet port of the medication nebulizer.

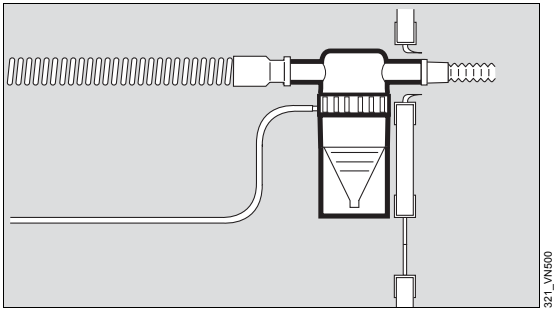


3 Connect the free end of the corrugated hose (B) to the inspiratory port of the Y-piece.

Additional information

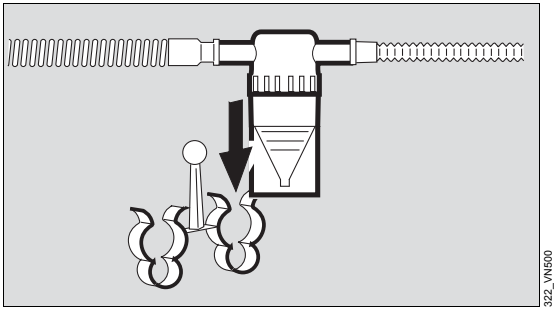
Depending on the Dräger breathing circuit used, an adapter may be required to connect the medication nebulizer.

When using on the incubator



- Push the inlet port or the outlet port of the medication nebulizer into the upper hose guide of the incubator.

When using without incubator



1 Press the inlet port or the outlet port of the medication nebulizer into one side of the clip and the expiratory hose into the other.

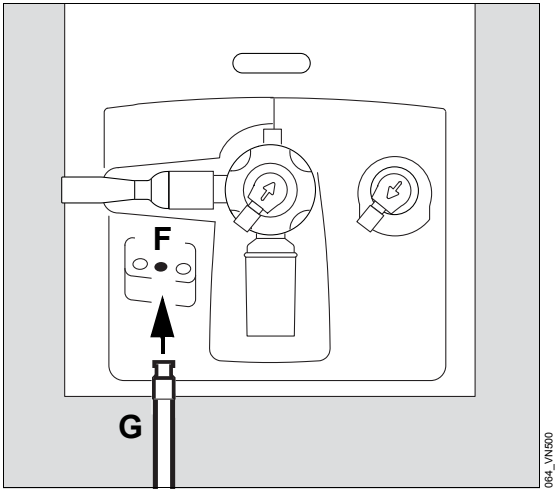
2 Place the medication nebulizer in the vertical position.

Connecting the nebulizer hose

WARNING

The nebulizer port (F) must be used for nebulization only! Otherwise the proper functioning of the device may be disrupted and the patient endangered.

- Connect the nebulizer hose (G) to the nebulizer port (F).



- Fill the medication nebulizer in accordance with the corresponding Instructions for Use.

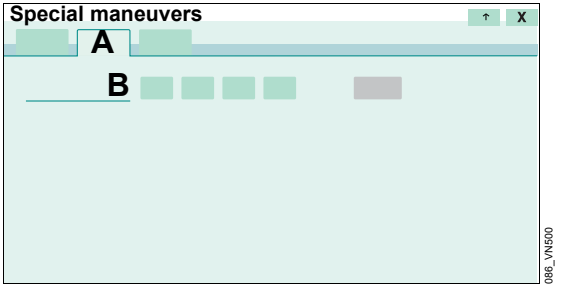
CAUTION

Check the correct functioning of the medication nebulizer. Check whether aerosol is generated. A medication nebulizer fault is not detected by Babylog VN500.

Switching on medication nebulization

1 Touch the ***Special maneuvers...*** button in the main menu bar.

2 Touch the ***Nebulization*** tab (A).

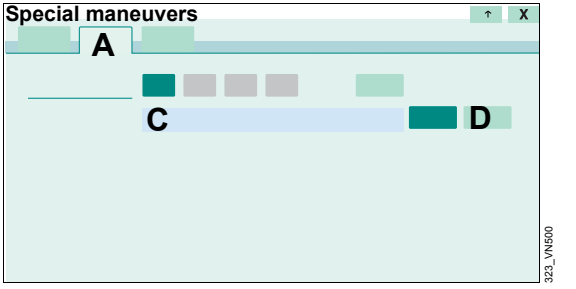


3 Touch the button for the desired nebulization time (B).

Nebulization can be set for 5, 10, 15, 30 minutes.

Deactivating flow monitoring

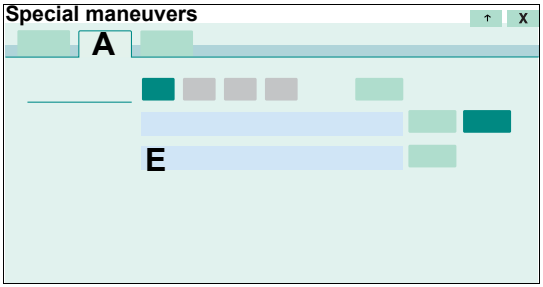
In the instruction field (C) Babylog VN500 requests the user to switch off flow monitoring.



- Touch the ***Off*** button (D) and confirm with the rotary knob.

Removing the neonatal flow sensor from the breathing circuit

In the instruction field (E) Babylog VN500 requests the user to remove the neonatal flow sensor from the breathing circuit.



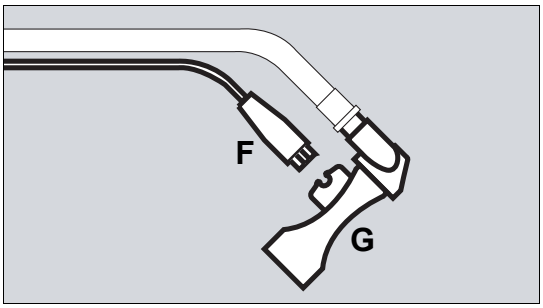
WARNING
Risk of fire

Before medication nebulization, remove the neonatal flow sensor from the Y-piece.

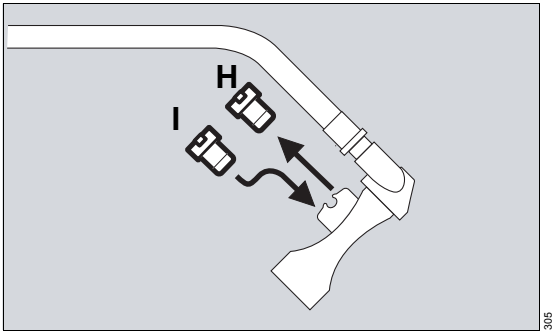
The wires of the neonatal flow sensor are hot. If the flow sensor is left in the breathing circuit during nebulization, medication aerosol deposits may build up and impair flow measurement. In the worst case, these deposits could catch fire!
Disconnecting the plug from the neonatal flow sensor is not sufficient to prevent this.

The minute volume is not monitored without the neonatal flow sensor and apnea monitoring is limited! Use additional monitoring.

When using the neonatal flow sensor Y-piece (8410185):



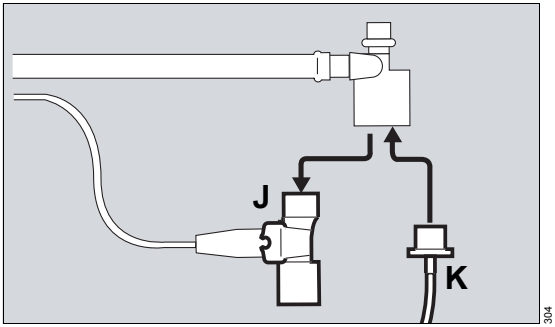
1 Disconnect plug (F) of the flow sensor cable from the neonatal flow sensor (G).



2 Remove the insert (H).

3 Insert the sealing plug (I) (8411024). The sealing plug is a component of the medication nebulizer.

When using the neonatal flow sensor ISO 15 (8411130):

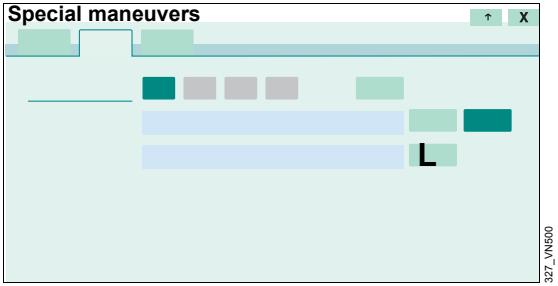


1 Remove the flow sensor (J) from the tube and the Y-piece.

2 Connect the tube (K) to the Y-piece.

- Replace or clean the neonatal flow sensor if there is visible soiling. See "Dismantling the neonatal flow sensor" on page 196.

After removing the neonatal flow sensor



- Touch the ***Done*** button (L).

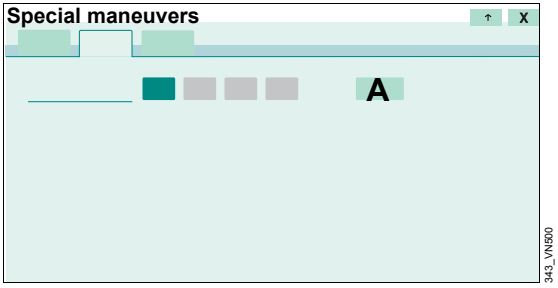
During medication nebulization

Babylog VN500 starts nebulization. The symbol and the remaining nebulization time is displayed in the screen header bar.

Babylog VN500 automatically switches off the medication nebulizer after the set nebulization time has elapsed.

A message indicating that nebulization has been ended appears in the screen header bar.

Aborting medication nebulization



- Touch the ***Cancel*** button (A).

Required steps after medication nebulization

1. Remove any residual medication. Observe the Instructions for Use of the medication nebulizer.
2. If a bacterial filter is used to protect the expiratory valve, exchange or remove the bacterial filter.
3. Reconnect the neonatal flow sensor.

   When using the neonatal flow sensor Y-piece (8410185):

   - Remove the sealing plug and push the insert back in.
   - Reconnect plug of the flow sensor cable.

   When using the neonatal flow sensor ISO 15 (8411130):

   - Re-insert the neonatal flow sensor in the Y-piece.
4. Activate flow monitoring with neonatal flow sensor, see page 127.
5. If the insert of the neonatal flow sensor was replaced, calibrate the neonatal flow sensor, see page 125.

Additional information

The ***Nebulization*** maneuver can be configured as a ***Nebulization*** button in the main menu bar to enable direct access. See "Assigning functions to additional buttons" on page 142.

Fitting the Aeroneb Pro nebulizer

- Observe the Instructions for Use of the Aeroneb Pro nebulizer.
- Observe the "Safety information for the use of HMEs, bacterial filters and breathing circuits" on page 46.
- Observe the "Safety information on medication nebulization" on page 92.
- Do not switch on the ***Nebulization*** maneuver on Babylog VN500 as the Aeroneb Pro nebulizer does not require a nebulizer flow from Babylog VN500.

Before nebulization with Aeroneb Pro

1 Deactivate flow monitoring with neonatal flow sensor, see page 127.

2 Remove the neonatal flow sensor from the breathing circuit, see page 95.

WARNING

Risk of fire

Before medication nebulization, remove the neonatal flow sensor from the Y-piece.

The wires of the neonatal flow sensor are hot. If the flow sensor is left in the breathing circuit during nebulization, medication aerosol deposits may build up and impair flow measurement. In the worst case, these deposits could catch fire!
Disconnecting the plug from the neonatal flow sensor is not sufficient to prevent this.

The minute volume is not monitored without the neonatal flow sensor and apnea monitoring is limited! Use additional monitoring.

After nebulization with Aeroneb Pro

1 If a bacterial filter is used to protect the expiratory valve, exchange or remove the bacterial filter.

2 Reconnect the neonatal flow sensor.

When using the neonatal flow sensor Y-piece (8410185):

- Remove the sealing plug and push the insert back in.
- Reconnect plug of the flow sensor cable.

When using the neonatal flow sensor ISO 15 (8411130):

- Re-insert the neonatal flow sensor in the Y-piece.

3 Activate flow monitoring with neonatal flow sensor, see page 127.

4 Calibrate the neonatal flow sensor, see page 125.

Additional information

- For the order number of the Aeroneb Pro nebulizer, see the list of accessories.

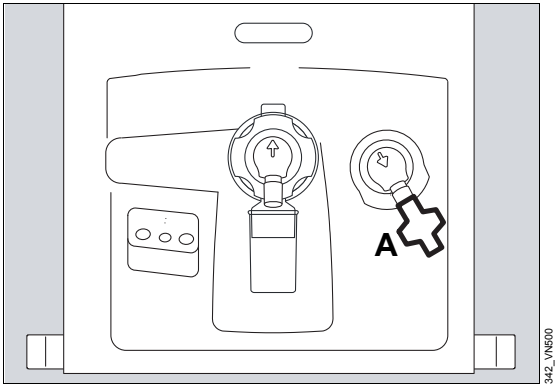
Gas supply unit GS500

In order to ensure continuous Air supply, Babylog VN500 can be equipped with the gas supply unit GS500. If Babylog VN500 is connected to the central gas supply system, GS500 ensures the supply of Air to the device in the case of failure of the central gas supply system and during the transportation of patients within the hospital.

Installing the bacterial filter

CAUTION

In order to protect the patient from contamination through the aspirated ambient air, an inspiratory bacterial filter must always be used.



- Fit the bacterial filter (A) onto the inspiratory port.

Using the gas supply unit

Prerequisite: Functionality of the gas supply unit is activated, see "Configuring supply units" on page 163.

If Babylog VN500 is not connected to the central gas supply system, GS500 starts the supply of Air automatically.

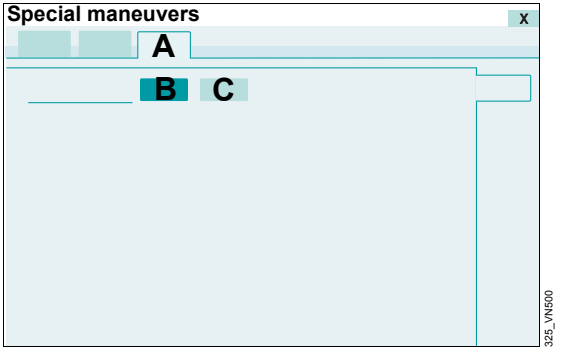
In the event of failure of the central Air supply, or if the probe of the Air compressed gas hose becomes detached from the wall terminal unit of the central gas supply system, Babylog VN500 displays an alarm message. The gas supply unit starts the supply of Air using GS500 after 4 seconds at the latest.

Switching on the gas supply unit for the transportation of patients within the hospital

1 Touch the ***Special maneuvers...*** button in the main menu bar.

2 Touch the ***Transport*** tab (A).

3 Touch the ***On*** button (B).



4 Pull out the probe of the Air compressed gas hose from the wall terminal unit of the central gas supply system.

If the probe of the Air compressed gas hose has not been pulled out within 5 minutes of the gas supply unit being switched on, Babylog VN500 switches off the gas supply unit.

5 Pull out the probe of the O_2 compressed gas hose from the wall terminal unit of the central gas supply system and provide a replacement O_2 supply if necessary.

Switching off the gas supply unit

- Touch the ***Off*** button (C).

Additional information

- Deactivating functionality of the gas supply unit, see "Configuring supply units" on page 163.

O_2 therapy

Safety information on O_2 therapy

During the O_2 therapy, only the O_2 concentration and the inspiratory pressure are monitored.

Oxygen masks, hoods, or nasal cannulas can be used for O_2 therapy.

CAUTION

Only use oxygen masks for the O_2 therapy. Do not use masks for non-invasive ventilation (NIV). Use of unsuitable masks may jeopardize the patient.

CAUTION

Internal monitoring is deactivated. Airway pressure and ventilation parameters, e.g., flow, minute volume or apnea are not monitored. Use external SpO_2 monitoring for patients who are dependent on an increased defined O_2 concentration. Otherwise a worsening of the patient's condition cannot be detected.

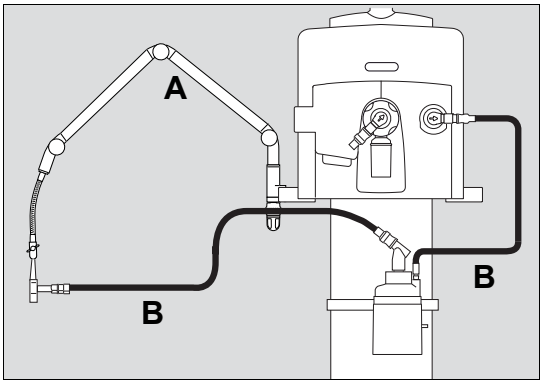
Preparing O_2 therapy

Attaching breathing hoses

WARNING

Do not use antistatic or conductive breathing hoses. The use of these materials increases the danger of electrical shock to the patient and of fire in an oxygen-enriched environment.

Preparing the system with Fisher & Paykel MR 850 breathing gas humidifier



1. Hang the hinged arm (A) on the rail and tighten the screws. Depending on the desired position of the device in relation to the bed, the hinged arm can be fitted to either side of the device.
2. Fit the breathing hoses (B) for inspiration. The expiratory ports on the device and on the Y-piece remain open!
3. Switch on Babylog VN500. See page 58.
4. Switch Babylog VN500 to standby. See page 101.
5. Activate O_2 monitoring. See page 128.

The alarm limits for MVe, RR, Paw, Tapn are not active. The alarm limits for O_2 monitoring are automatically set by the device.

Switching on O_2 therapy

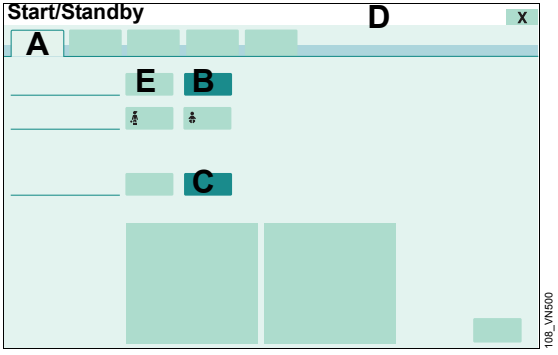
The O_2 therapy can only be switched on in standby mode.

1 Touch the ***Start/ Standby...*** button in the main menu bar.

Babylog VN500 opens the ***Start/Standby*** dialog window. The ***Start/Standby*** page (A) appears by default.

2 Touch the ***Standby*** button (B) and confirm with the rotary knob.

Babylog VN500 is in standby mode.



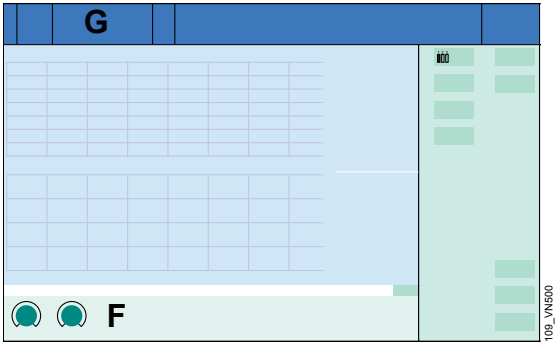
3 Touch the ***O_2 Therapy*** button (C).

The message field (D) displays the information to use specific masks for O_2 therapy.

4 Connect a mask, hood, or nasal cannula for O_2 therapy.

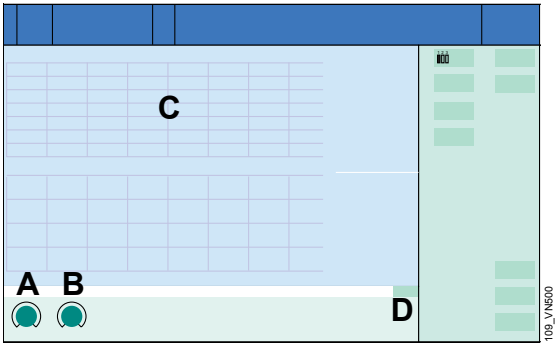
5 Touch the ***Start*** button (E) and confirm with the rotary knob.

O_2 therapy is switched on. Babylog VN500 displays the main screen with the therapy bar (F) for O_2 therapy. The header bar (G) displays the message ***O_2 Therapy***.



During O_2 therapy, the screen display on the main screen cannot be customized.

Setting FiO_2 and flow for O_2 therapy



1 Touch the corresponding therapy control in the therapy bar:
- ***FiO_2*** (A)
- ***Flow*** (B)

2 Set the value by turning the rotary knob and push to confirm.

The FiO_2 concentration is represented graphically (C).

Setting O_2 and flow in the dialog window

The O_2 and flow can also be set in the ***Ventilation settings*** dialog window.

- Touch the button ***Ventilation settings...***.

Or

- Touch the ↑ button (D).

Switching off O_2 therapy

1 Touch the button ***Start/ Standby...***.

Babylog VN500 opens the ***Start/Standby*** dialog window. The ***Start/Standby*** page appears by default.

2 Touch the ***Standby*** button and confirm with the rotary knob.

Babylog VN500 is in standby mode. O_2 therapy is switched off. The therapy type can be switched to ventilation.

Standby mode

Switch to standby mode for the following actions:
– Keep Babylog VN500 ready for operation while the patient is absent
– Change the therapy type between ventilation and O_2 therapy
– Change the patient category
– Change the application mode
– Perform the device and breathing circuit check
– Query the status of accessories
– Switch off Babylog VN500

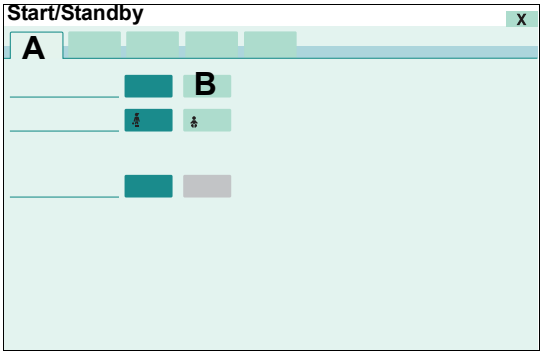
WARNING

Ventilation does not take place in standby mode! The device must only be set to standby mode when no patient is connected to the device. The patient may otherwise be jeopardized.

Activating standby mode

1 Touch the ***Start/ Standby...*** button in the main menu bar.

Babylog VN500 opens the ***Start/Standby*** dialog window. The ***Start/Standby*** page (A) appears by default.



2 Touch the ***Standby*** button (B) and confirm with the rotary knob.

The message ***Standby mode activated*** is displayed in the header bar.

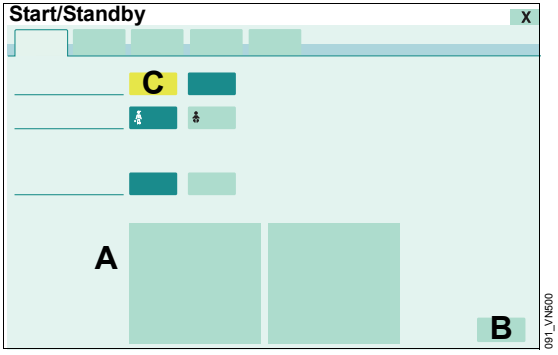
3 Touch the ***ALARM RESET*** button in the header bar and confirm with the rotary knob.

Babylog VN500 is in standby mode. ***Standby*** is displayed in the screen header bar.

Continuing the therapy

1 Check the ventilation settings (A) of the current patient.

Change the ventilation settings if necessary. Touch the ***Ventilation settings*** button (B).
Babylog VN500 opens the relevant page.



2 Touch the ***Start*** button (C) and confirm with the rotary knob.

The main screen is displayed, Babylog VN500 continues ventilating.

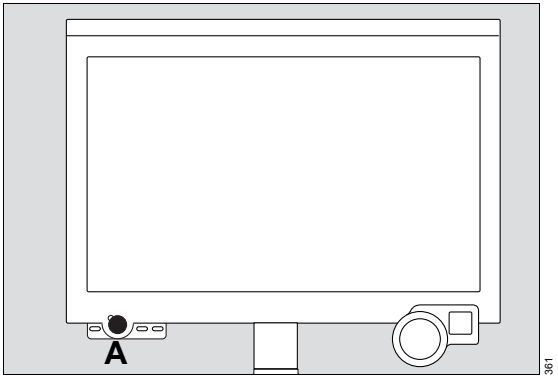
Additional information

If the patient category or the body weight is changed, Babylog VN500 determines new start-up values for ventilation. See "Admission of a new patient" on page 59.

For information on changing ventilation settings, see "Setting ventilation" on page 74.

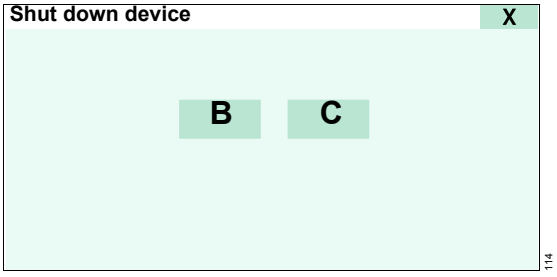
Ending operation

1 Switch Babylog VN500 to standby mode: Touch the ***Start/ Standby...*** button in the main menu bar. Touch the ***Standby*** button and confirm with the rotary knob.



2 Press the ⏻ key (A) on Infinity C500.

Babylog VN500 opens the ***Shut down device*** dialog.



3 Touch the ***OK*** button (B) and confirm with the rotary knob.

Babylog VN500 ends operation.

To return to standby mode:

- Touch the ***Cancel*** button (C).

When Babylog VN500 is not in standby mode and the ⏻ button (A) is pressed, the ***Start/Standby*** page is opened.

As soon as the screen is completely dark

- Disconnect the mains plug from the mains power socket.
- Pull out the probe of the Air compressed gas hose and the probe of the O_2 compressed gas hose from the wall terminal units of the central gas supply system.

CAUTION

Disconnect the compressed gas hoses from the central gas supply system. Otherwise minute internal leaks could contaminate the central gas supply system through the reverse flow of supply gases.

CAUTION

The compressed gas hoses must only be unscrewed from the ventilation unit after the probes have been removed from the wall terminal units of the central gas supply system. Otherwise the compressed gas hoses are not depressurized and the user may be injured.

If Babylog VN500 cannot be switched off on account of a device malfunction

1 Open the device flap on the left side of Babylog VN500.

2 Set the toggle switch to ◯ (off).

Once the toggle switch has been pressed and the mains plug is disconnected, Babylog VN500 cannot be switched on.

Placing back into operation

1 Insert the mains plug into the mains power socket.

2 Open the device flap on the left side of Babylog VN500.

3 Set the toggle switch to | (on).

4 For switching on Babylog VN500, press the ⏻ key on Infinity C500.

Storing Babylog VN500

Switch Babylog VN500 to energy-saving mode if stored for longer periods.

1 End operation. See "Ending operation" on page 102.

2 Set the toggle switch on the left side of Babylog VN500 to ◯ (off) immediately after switching off the device.

3 Disconnect the mains plug from the mains power socket.

Mains power supply / DC power supply

Components and terms

Mains power supply

The device is supplied with mains power via the power cable. Information on voltage ranges and mains power characteristic values can be found in chapter Technical Data, Operating data.

Internal Battery

If Workstation Neonatal Care has been ordered without the power supply unit PS500, the internal battery is included in the scope of delivery of Babylog VN500.

The internal battery ensures that operation of the device can continue for 30 minutes following failure of the mains power supply. If the gas supply unit GS500 is connected and active, battery operation can continue for at least 15 minutes. This applies when the battery is fully charged and new and ventilation is typical.

Typically, the internal battery is only fully charged after charging for 4 hours. The ▬▬▯ symbol is displayed in the screen header bar.

Power supply unit PS500

Workstation Neonatal Care may be equipped with the power supply unit PS500 instead of the internal battery.

In the event that the mains power supply fails, Babylog VN500 switches over (without interruption) to the power supply unit PS500. The power supply unit PS500 ensures that operation of the device can continue for 360 minutes following failure of the mains power supply. With the gas supply unit GS500, the power supply unit PS500 can maintain operation for at least 180 minutes. This applies when the batteries are fully charged and new and ventilation is typical.

Typically, the batteries of the power supply unit are only fully charged after charging for 11 hours. The ▬▬▯ PS500 symbol is displayed in the screen header bar.

Use of power supplies

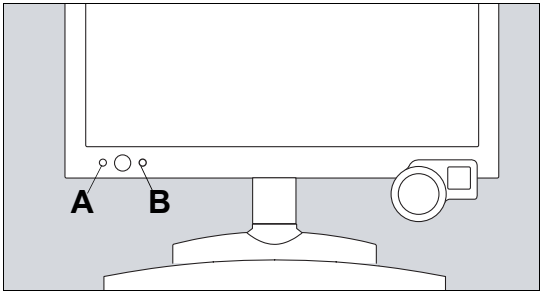
The supply of Babylog VN500 with electrical power is prioritized based on the following sources:
– Mains power
– Batteries

The switch-over between these sources takes place without interruption to operation according to the following rules:
– If there is sufficient mains power, the mains power supply is always used as the power source.
– If the supply of mains power is not sufficient, the batteries are used.

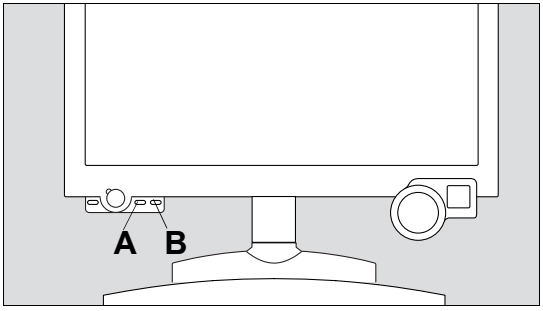
Display of power supplies

The power supply is displayed on the operating and display unit Infinity C500.

On Infinity C500 (MS18746):



On Infinity C500 (MK31500):



A LED for mains power:
- Lights green when mains power is applied and the toggle switch is in the | position.
- If the LED does not light up, the device is disconnected from the mains power.

B LED for the batteries:
- Lights green when the state of charge is greater than 90 %.
- Lights yellow when the state of charge is between 10 % and 90 %.
- Does not light if the batteries are discharged or faulty.
- Does not light if no mains power is present and the device is switched off (energy-saving mode).

Battery operation

Alarm messages during battery operation

Switch-over to the batteries is indicated with the alarm message ***Battery activated***. The alarm priority can be configured, see "Setting the priority of the battery alarm" on page 147.

As soon as the charge state is less than 10 %, the alarm message ***Battery low*** is generated.

After expiration of the operating time, the device generates the alarm message ***Battery discharged***.

- Reestablish the mains power supply immediately to avoid an interruption of the ventilation functions.

If power was supplied from the batteries, recharge the batteries, see page 105.

Operating time with battery operation

The operating time depends on the following factors:
- State of charge
- Age
- Number of charging cycles

The following operating times are possible if the batteries are fully charged and new, and ventilation is typical:

Babylog VN500 without PS500 and with GS500:	15 minutes
Babylog VN500 without PS500 and without GS500:	30 minutes
Babylog VN500 with PS500 and with GS500:	180 minutes
Babylog VN500 with PS500 and without GS500:	360 minutes

Observe the maintenance intervals.

Charging batteries

The batteries are being charged when Babylog VN500 is supplied with mains power.

Charging display on screen

The charge state of the batteries is displayed in the screen header bar (A).

Symbol	State of charge
	90 to 100 %
	60 to <90 %
	40 to <60 %

Symbol	State of charge
	20 to <40 %
	<20 %, flashes in 1-second pulses light and dark red
	Batteries defective or no information available on their charge state

When the batteries are being charged, the last segment in the battery symbol flashes white.

Charging times

The following minimum charging times are required:

Babylog VN500 without PS500: 4 hours

Babylog VN500 with PS500: 11 hours

The charging time increases significantly when the batteries are warm, e.g., due to high ambient temperatures or when there is excessive discharge of the batteries.

Battery maintenance

To ensure a maximum service life, the following is recommended:

- Always fully charge the batteries.
- Connect Babylog VN500 to the mains power supply at the latest after 5 days to charge the batteries. Observe charging times.

If recharging is not possible at the latest after 5 days, do the following:

- Set the toggle switch to the ◯ position and then disconnect the mains plug.

Babylog VN500 is in energy-saving mode. This reduces the spontaneous discharge rate of batteries. Check that the capacity of the batteries is sufficient before use on a patient. The batteries can be deep discharged or destroyed by excessively long storage.

Batteries are wear parts. The batteries must be exchanged depending on the degree of wear. Observe the maintenance intervals.

Storage at an increased ambient temperature reduces the service life of the batteries. The following times must not be exceeded:

– Temperature –20 °C to +45 °C (–4 °F to +113 °F): up to 6 months
– Temperature +45 °C to +65 °C (+113 °F to +149 °F): up to 1 week

The capacity of the batteries used must be checked regularly. The batteries must always have sufficient capacity. Exchange the batteries if necessary.

Alarms

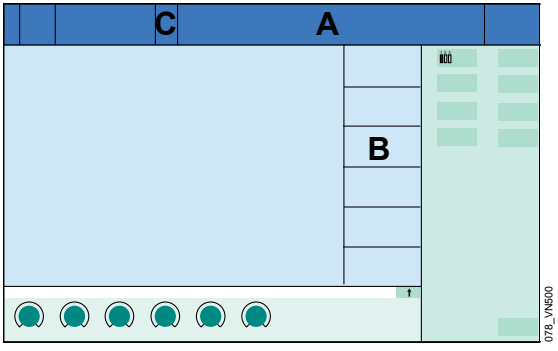
Overview

Alarms are issued acoustically and visually. The alarm tone can be suppressed for 2 minutes.

The ***Alarms*** dialog window provides the following functions for selection:
– Setting alarm limits
– Displaying current alarms
– Alarm history
– Alarm settings

Display of alarms

In the event of an alarm, the system displays the relevant alarm message in the alarm message field (A). If the parameter field (B) is configured to display an individual parameter, the parameter field (B) of the parameter triggering the alarm flashes.



If the alarm message field contains more alarms than can be displayed, the ***More...*** button (C) appears in the header bar. Touching this button opens the page containing all the active alarms.

Alarm priorities

Babylog VN500 assigns the appropriate priority to each alarm message.

The background color of the alarm message field indicates the priority of active alarm messages. The parameter field of the parameter triggering the alarm flashes in the color matching the alarm priority.

Warning	High-priority alarm message	Red background
Caution	Medium-priority alarm message	Yellow background
Note	Low-priority alarm message	Cyan background

High-priority alarm messages that are no longer active are displayed in the background color of the alarm message field.

Babylog VN500 generates different alarm tone sequences to display alarms acoustically. The alarm tone sequences can be configured, see "Selecting alarm tone sequences" on page 147.

Displaying information on alarms

Displaying current alarms

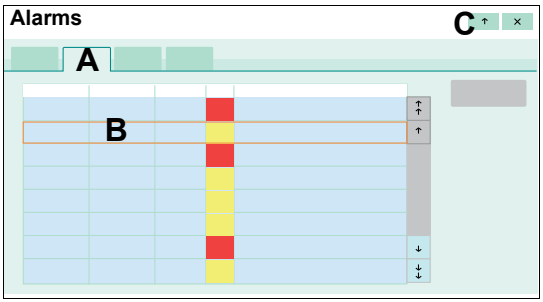
To display the current alarms, proceed as follows:

1 Touch the alarm message in the header bar.

Or

1 Touch the ***Alarms...*** button in the main menu bar.

2 Touch the ***Current alarms*** tab (A).



All the current alarm messages are displayed chronologically with the corresponding duration, priority and alarm message text in the list (B).

Displaying the cause and remedy for an alarm

1 Touch the alarm message or select it in the list (B) with the rotary knob.

2 Touch the (C) button.

This displays the cause and remedy for the alarm message selected.

3 Eliminate the fault.

Additional information

For a list of causes and remedies, see chapter "Alarm – Cause – Remedy" on page 165.

Acknowledging an alarm message that is no longer active

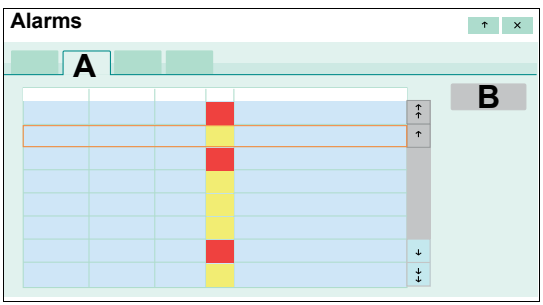
After the fault has been eliminated, the alarm tone is silenced. Medium- and low-priority alarm messages expire automatically. High-priority alarm messages continue to be displayed even after the cause of the alarm has been eliminated and need to be acknowledged.

1 Touch the ***ALARM RESET*** button (A) in the header bar.

2 Confirm with the rotary knob.

Acknowledging all alarm messages that are no longer active

Prerequisite: The ***Current alarms*** page (A) is opened.



1 Touch the ***Reset all*** button (B).

2 Confirm with the rotary knob.

The acknowledgeable messages are deleted in the header bar and in the list containing the current alarms. However, Babylog VN500 records all alarm messages in the alarm history.

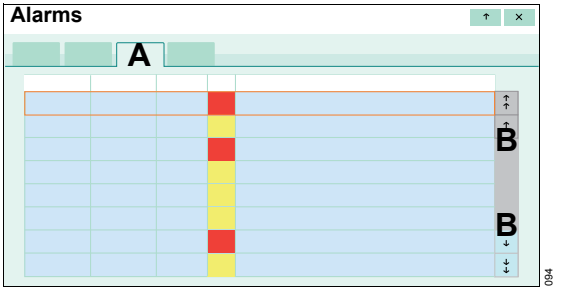
Alarm history

The alarm history records all alarm messages in chronological order.

The entries in the alarm history are also retained after the device has been switched off and on again or following a power supply failure.

1 Touch the ***Alarms...*** button in the main menu bar.

2 Touch the ***Alarm history*** tab (A).

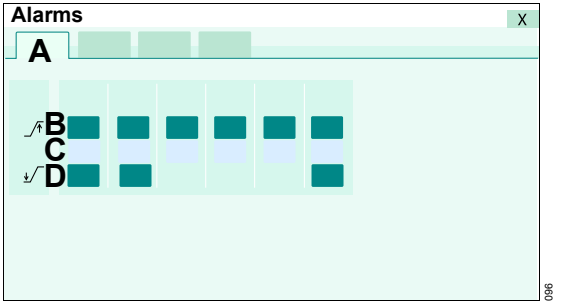


3 Use the buttons (B) to scroll in the alarm history.

Setting alarm limits

- Touch the ***Alarms...*** button in the main menu bar.

The ***Limits*** page (A) appears by default.



The alarm limit settings and the current measured value are displayed.

(B) ↑ : Upper alarm limit

(C) Current value : Current measured value

(D) ↓ : Lower alarm limit

How to set an alarm limit

Prerequisite: The ***Limits*** page (A) is opened.

1 Touch the corresponding button for the alarm limit.

2 Set the value by turning the rotary knob and push to confirm.

WARNING

The alarm limits must be set to meet the needs of the therapy required by the current patient. The patient may otherwise be jeopardized.

Additional information

The start-up values for the alarm limits can be configured specifically as required by the hospital concerned, see page 145.

Setting extreme alarm limits can render the alarm system useless.

The alarm limits are displayed depending on the ventilation parameter in the parameter field.

Deactivating alarm limits

WARNING

Alarms must only be deactivated if the safety of the patient is not jeopardized by the absence of an alarm!

The following alarm limits can be deactivated:

Patient category	Invasive ventilation	Non-invasive ventilation
Ped. pat.	RR high	MV low
		RR high
		Tapn
Neo.	MV low	MV low
	RR high	RR high
	Tapn	Tapn

How to deactivate an alarm limit

1. Touch the corresponding button for the alarm limit.
2. Continue turning the rotary knob until ***Off*** is displayed instead of the value.
3. Confirm with the rotary knob.

The alarm limit is deactivated. Babylog VN500 displays the  symbol in the header bar and the deactivated alarm limit. The header bar can display up to 5 deactivated alarm limits.

Response to power failure

Alarm limits are also retained in the event of a power failure, e.g., caused by a defective internal battery.

Display of alarm limits in the parameter field

If the alarm limits are assigned to a ventilation parameter, the alarm limits are displayed in the parameter fields for single parameters (standard and double size).

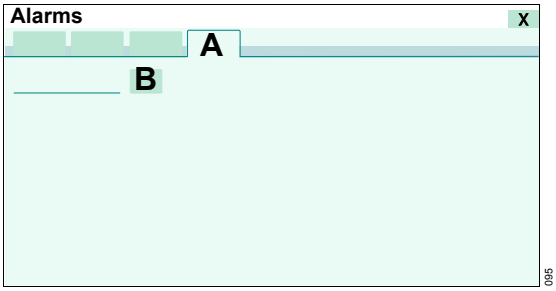
The following assignments have been defined:

Alarm limits	Measured values
MV high, MV low	MVe
Paw high	PIP
RR high	RR
Tdisconnect (in ***NIV*** mode)	PEEP

Setting the volume of the alarm tone

1 Touch the ***Alarms...*** button in the main menu bar.

2 Touch the ***Settings*** tab (A).



3 Touch the (B) button.

4 Set the volume of the alarm tone by turning the rotary knob and push to confirm.

WARNING

The volume of the acoustic alarm must be set loud enough to ensure that an alarm can be heard!

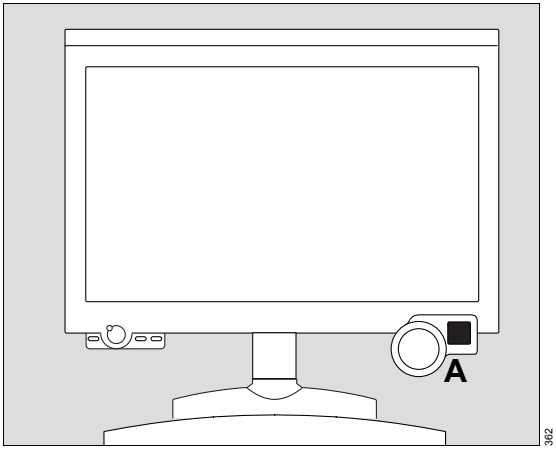
During the automatic switch-over between day and night modes, the alarm tone volume setting is overwritten by the volumes defined for these times. An automatic increase in volume can be activated. See "Setting the alarm tone" on page 147.

Additional information

The ***Settings*** page can be configured for direct access into the main menu bar as the ***Alarm volume*** button. See "Assigning functions to additional buttons" on page 142.

Suppressing the alarm tone

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



- Press the 🔕 ***Audio paused*** key (A).

This suppresses the acoustic alarm for 2 minutes.

Babylog VN500 displays the 🔕 symbol in the header bar and the remaining time for the suppressed alarm tone.

If an alarm with a higher priority appears during this time, the alarm tone sounds once.

If the fault triggering the alarm is not eliminated after 2 minutes, the alarm tone sounds again.

Reactivate the alarm tone before the suppression time has elapsed:

- Press the 🔕 ***Audio paused*** key (A) again.

Position of the user to the alarm system

The alarm system is designed such that the user can recognize alarm messages from a distance of 1 meter (39 in). The volume of the alarm tone specified applies to a distance of 1 meter (39 in) in front of the device and a height of 1.5 m (59 in).

Failure of the acoustic alarm

If the loudspeaker for acoustic alarm signaling (main alarm) fails on account of a defect, an intermittent tone will be generated by the loudspeaker for the auxiliary alarm.

This intermittent tone is also used for the power failure alarm.

Additional information on the power failure alarm

See "Failure of the electrical power supply" on page 52.

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Trends and data

Overview

Babylog VN500 saves measured value and trend data. Trends are displayed in the form of a graphic or a table. The following can be displayed: current measured values, settings and hospital-specific combinations of measured and setting values. The logbook can save up to a maximum of 5000 entries. Data can be exported with a USB storage medium.

The ***Trends/Data*** dialog window provides the following functions for selection:
– Display trends
– Display data
– Logbook
– Data export

Displaying trends

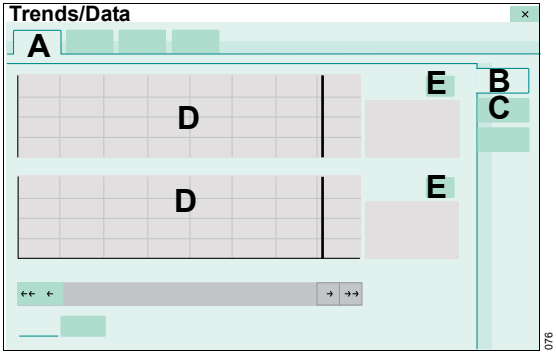
Trends are displayed as a graphic or a table. Trends are recorded for up to 7 days.

In graphic trends, measured values are displayed in blue and setting values in green. In the apnea trend, the number of the apneic events that occurred per minute is represented as a histogram. In tabular trends, measured values are displayed in blue writing and setting values in green writing.

Graphic trends

1 Touch the ***Trends/Data...*** button in the main menu bar.

Babylog VN500 opens the ***Trends*** page (A) with the ***Graphics 1*** page (B).



Displaying an additional graphic trend

Prerequisite: The ***Trends*** page (A) is opened.

- Touch the ***Graphics 2*** tab (C).

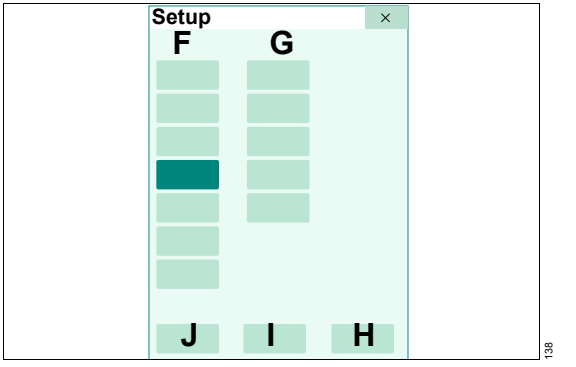
Each page contains 2 graphic trend displays (D).

Selecting parameters for the graphic trend display

Prerequisite: The ***Graphics 1*** or ***Graphics 2*** page is open.

1 Touch the button (E).

The ***Setup*** dialog is displayed with the buttons for ***Meas.*** (F) and ***Settings*** (G).



The measurements (F) are divided into the following parameter types:
– Pressures
– Minute vol.
– Volume/Flow
– Gases
– Timing/Cycl.
– Others
– Events

The settings (G) are divided into the following parameter types:
– Pressures
– Volume/Flow
– Gases
– Timing/Cycl.
– Others

2 Touch the appropriate button for measurements or settings.

Another dialog containing all the parameters of the selected parameter type is displayed.

3 Touch the desired parameter.

4 Confirm with the ***OK*** button.

The dialog for the group selected is closed.

A maximum of 3 parameters can be selected for each graphic trend display. If 3 parameters are already selected, one parameter must be deselected before selecting a new parameter.

5 Select further parameters according to step 2 to 4.

6 Confirm the parameter selection with the ***OK*** button (H).

The selected parameters are displayed in the trend display. The ***Setup*** dialog is closed.

The selection can be aborted with ***Cancel*** (I). The previous selection is displayed in the graphic trend.

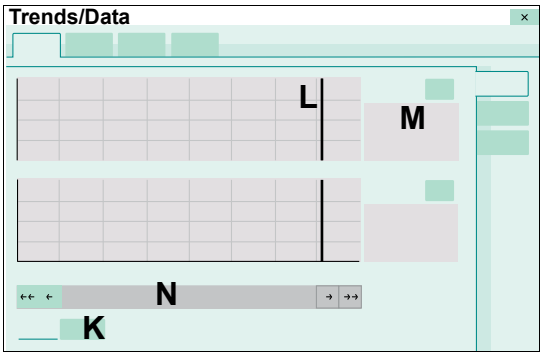
Clear (J) can be used to delete all parameter selections made.

Deselecting a parameter in the trend display

Touch the parameter to be deselected in the parameter type dialog. The button turns pale green.

Selecting a time interval for the graphic trend display

Prerequisite: The ***Graphics 1*** or ***Graphics 2*** page is open.



1 Touch the button for the time interval (K).

2 Select the time interval from the selection list (2, 4, 8, 12 hours; 1 day, 7 days).

Displaying the value of a parameter at a certain moment in time

- Position the cursor (L) on the time by turning the rotary knob or touching the time.

The parameter value and the marked time are displayed (M).

The marked time in the trend display also corresponds with the marked row of this time in the logbook.

Changing the displayed time period

- Touch the buttons in the scrollbar (N) or turn the rotary knob.

Apnea trend, apnea ventilation trend

In the apnea trend, the number of the apneic events that occurred per minute is represented as a histogram. The number per minute is represented as a bar height. If an apnea lasts longer than one minute, the apnea is only counted once in the period of occurrence.

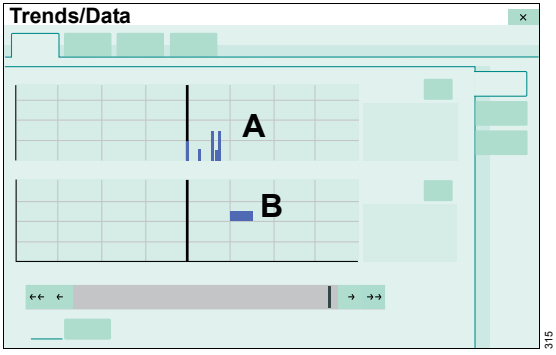
In the apnea ventilation trend, the system displays whether or not apnea ventilation is activated.

Prerequisite: The ***Graphics 1*** or ***Graphics 2*** page is open.

1 Touch the button .

2 In the ***Setup*** dialog window under ***Meas.***, touch the ***Events*** parameter type.

3 Select the ***Apnea*** or ***Apnea Vent.*** event.



A Apnea trend

B Apnea ventilation trend

Additional information

The apnea trend is only recorded when apnea ventilation is switched off.

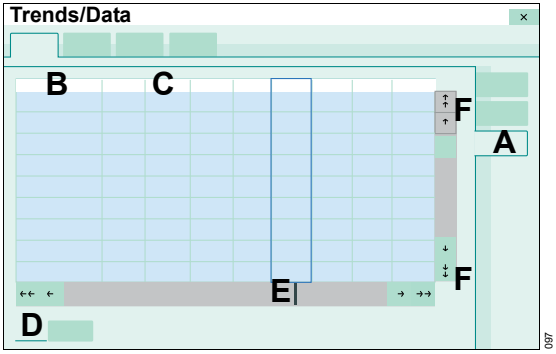
The duration of an apnea is displayed only in the alarm history.

Tabular trend

Babylog VN500 displays the trends of all parameters in a table. The parameters that are first displayed correspond with the parameters configured specifically for the hospital. These are followed by all measured values, and then all setting values.

1 Touch the ***Trends/Data...*** button in the main menu bar.

2 Touch the ***Table*** tab (A).



The trend values for the parameters (B) with the units are displayed in 7 to 8 time columns (C). Use the buttons (F) to scroll in the trend table.

Selecting a time interval for the tabular trend display

1 Touch the button for the time interval (D).

2 Select the time interval from the selection list (5, 10, 30 minutes; 1, 2, 6, 12 hours; 1 day).

Displaying the value of a parameter at a certain moment in time

- Position the cursor (E) on the time by turning the rotary knob or touching the time.

Additional information

"Configuring the display of hospital-specific measured values and settings" on page 142.

The ***Table*** page can be configured for direct access into the main menu bar as the ***Trends table*** button. See "Assigning functions to additional buttons" on page 142.

Displaying data

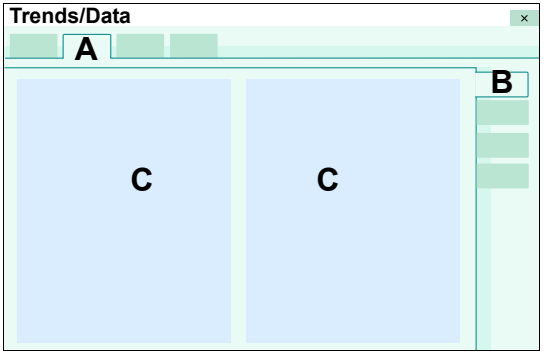
The following data can be displayed:
– Hospital-specific data
– Measured values 1
– Measured values 2
– Setting values

Measured values are displayed on a blue background and setting values on a green background.

Displaying hospital-specific data

1 Touch the ***Trends/Data...*** button in the main menu bar.

2 Touch the ***Values*** tab (A).



Babylog VN500 opens the page containing the current, hospital-specific measured and setting values (B).

Babylog VN500 displays the hospital-specific measured and setting values (C) selected in the system setup.

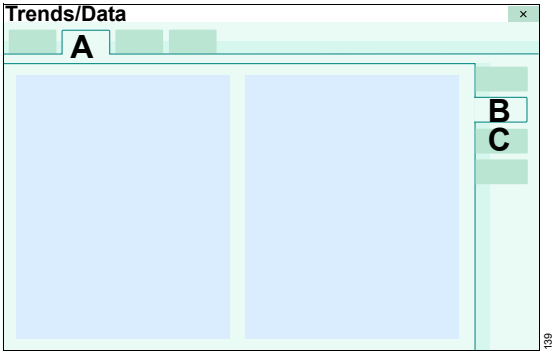
Additional information

"Configuring the display of hospital-specific measured values and settings" on page 142.

Displaying all measured values

Prerequisite: The ***Values*** page (A) is opened.

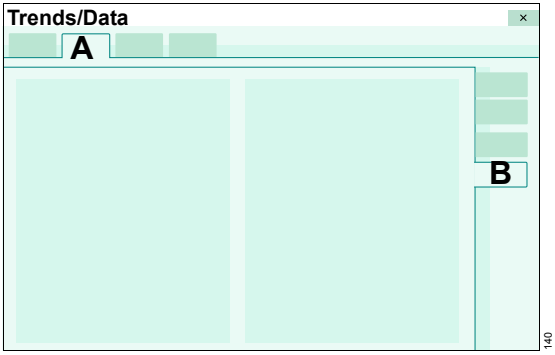
- Touch the ***Values 1*** (B) or ***Values 2*** (C) tab.



Displaying setting values

Prerequisite: The ***Values*** page (A) is opened.

- Touch the ***Settings*** tab (B).



Additional information

The ***Values*** page can be configured for direct access into the main menu bar as the ***Values*** button. See "Assigning functions to additional buttons" on page 142.

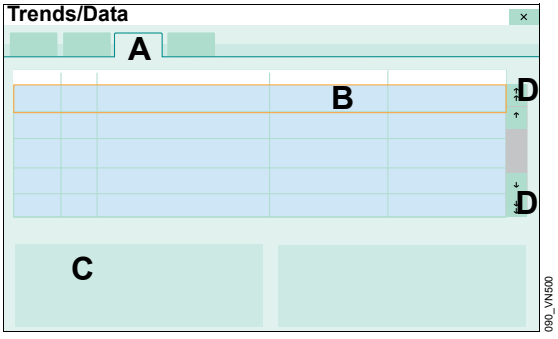
Displaying the logbook

The logbook records changes, events and alarms in chronological order. A maximum of 5000 logbook entries is possible. Events include, for example, use of the medication nebulizer or flow calibration. For alarms only the occurrence of the alarm condition is recorded, not its termination.

The entries in the logbook are also retained after the device has been switched off and on again or following a power supply failure.

1 Touch the ***Trends/Data...*** button in the main menu bar.

2 Touch the ***Logbook*** tab (A).



Babylog VN500 opens the logbook. The cursor (B) marks a row in the logbook. The marked row corresponds with the cursor position in the trend display.

For the marked row Babylog VN500 displays all the setting values of the ventilation mode effective at this time in the field (C).

Displaying the setting parameters at another moment in time

- Select the row by turning the rotary knob or touching the row.

With the button (D) the cursor can be moved backwards or forwards by least 24 hours.

Additional information

The ***Logbook*** page can be configured for direct access into the main menu bar as the ***Logbook*** button. See "Assigning functions to additional buttons" on page 142.

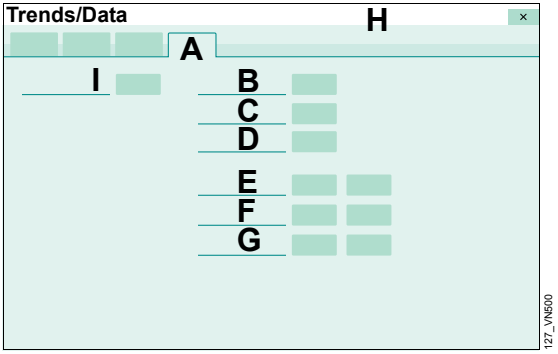
Data export

The data export takes place via a USB storage medium. A maximum of 5000 logbook entries from the last 7 days can be exported.

1 Insert the USB storage medium into one of the USB ports of Infinity C500.

2 Touch the ***Trends/Data...*** button in the main menu bar.

3 Touch the ***Export data*** tab (A).



The following data can be exported:
– Current settings and measured values (B)
– Results obtained from the device check (C)
– Results obtained from the breathing circuit check (D)
– Logbook 1 day or 7 days (E)
– Alarm history 1 day or 7 days (F)
– Trends 1 day or 7 days (G)

4 Touch the appropriate button for the export of the related data.

5 For the export of all the data, touch the ***All data*** button (I).

The data is exported to the USB storage medium. After the successful completion of the data export, Babylog VN500 displays a message in the message field (H).

After the data export

- Remove the USB storage medium from the USB port at the earliest after 2 seconds.

If data export was not successful

If data export fails owing to the USB storage medium being full, the buttons are deactivated.

- Remove the USB storage medium from the USB port and use a different USB storage medium.

Additional information

The buttons are deactivated when a USB storage medium is not connected.

The exported files can only be viewed with a Unicode-enabled editor and a Unicode font.

An import into word processors or spreadsheets is possible.

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Monitoring

Information on monitoring

Monitoring is activated at the factory. Each monitoring function can be deactivated separately.

After the device is switched on, O_2 monitoring and flow monitoring are activated.

Possible displays for measured values

Instead of a measured value, the following displays are possible in the parameter fields or tables:

Display	Cause
OFF	Monitoring deactivated by user
ERR	Sensor error
CAL	Calibration active, no measured value display possible
Measured value?	Reduced sensor accuracy
No measured value	Prerequisites for measurement or calculation currently not met
+++	Measured value above specified measurement range
---	Measured value below specified measurement range

Display of $etCO_2$ measured values

The measured value for $etCO_2$ can be displayed in Vol%, kPa or mmHg. The display is configurable, see "Configuring units" on page 161.

Information on the sensors used

Babylog VN500 uses the following sensors for measurement and monitoring purposes:
– Neonatal flow sensor
– O_2 sensor
– Pressure sensor
– CO_2 sensor

CAUTION
Regular calibration is essential to ensure that the sensors deliver reliable and accurate results. Otherwise the proper functioning of the device may be impaired.

Automatic calibration of the pressure sensors takes place immediately and an hour after the device has been switched on, afterwards every 12 hours.

For calibrating or checking the other sensors, see:
– "Calibrating the neonatal flow sensor" on page 125
– "Calibrating the O_2 sensor" on page 127
– "Information on checking the CO_2 sensor" on page 129

The calibration or zero-checking values of the sensors that were last determined remain stored until the next calibration or zero check, even if the device is switched off.

Flow monitoring

Information on flow monitoring

The measured values for ***MVe*** and ***VTe*** are not leakage-corrected and are therefore lower than the actual minute and tidal volumes applied to the patient if a leakage occurs. When leakage compensation is activated, the measured volume and flow values as well as the curves for flow and volume are displayed with leakage correction.

Babylog VN500 compensates leakages up to 100 % of the set tidal volume ***VT***. Pressure-controlled ventilation is recommended in the case of larger leakages.

In order to avoid false alarms and assure proper monitoring, the following settings are required:

- Adjust both alarm limits for MVe in line with the current value.
- Use additional monitoring, e.g., external SpO_2, if necessary.

CAUTION
Patient hazard!
Use additional external monitoring during ventilation with very low tidal volumes.

Calibrating the neonatal flow sensor

Calibration of the neonatal flow sensor corresponds to a zero calibration.

Manual calibration of the neonatal flow sensor is necessary:
– During the device check and before use
– At least once a day
– After replacing the neonatal flow sensor
– After medication nebulization

Recalibration is not necessary if the neonatal flow sensor has been unplugged only briefly.

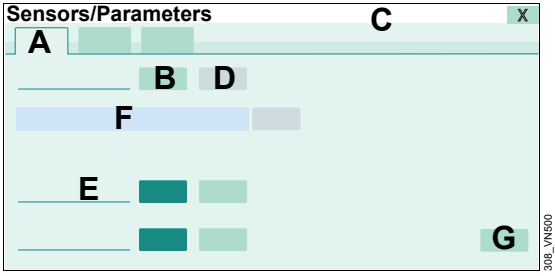
Before each manual calibration, started from the device check or from the ***Sensors/Parameters*** dialog window, Babylog VN500 automatically cleans the neonatal flow sensor through heating.

WARNING
Patient hazard due to ignition in the flow sensor.
Residual vapors of flammable substances (e.g., alcohols) may cause a fire during calibration of the flow sensor. This can destroy the flow sensor and injure the patient or user.
Air flow sensors for at least 30 minutes after disinfection.

Starting calibration of the neonatal flow sensor

1 Touch the ***Sensors/ Parameters...*** button in the main menu bar.

Babylog VN500 opens the ***Sensors/Parameters*** dialog window. The ***Neonatal flow sensor*** page (A) appears by default.



Select ***Sensor type*** (E) being used:

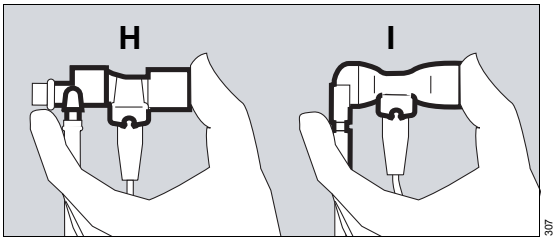
2 Touch the ***Y flow sensor*** or ***ISO-15 flow sensor*** button.

3 Touch the ***Start*** button (B).

The instruction field (F) displays the instructions for performing calibration.

Removing the neonatal flow sensor

4 Remove the tube connector.



5 Put on a sterile glove.

6 Seal the neonatal flow sensor ISO 15 (H) or neonatal flow sensor Y-piece (I).

This ensures that the requirement for calibration (flow = 0) is met.

Performing calibration

7 Press the rotary knob.

Babylog VN500 calibrates the neonatal flow sensor.

Babylog VN500 displays calibration information in the message field (C).

At the completion of calibration, the ***Start*** button turns pale green.

Canceling calibration of the neonatal flow sensor

- Touch the ***Cancel*** button (D).

After calibration of the neonatal flow sensor

8 Connect the tube connector.

Setting the flow trigger

- Touch the ***Trigger*** button (G).

Babylog VN500 opens the page for setting the flow trigger. For additional information, see "Additional settings for ventilation" on page 79.

Additional information

The ***Neonatal flow sensor*** page can be configured for direct access into the main menu bar as the ***Neonatal flow sensor*** button. See "Assigning functions to additional buttons" on page 142.

Deactivating or activating flow monitoring

The ventilation functions and ventilation monitoring are limited when flow monitoring is deactivated.

WARNING

If flow and volume monitoring is deactivated, ensure that an appropriate replacement monitoring function is available immediately. The patient may otherwise be jeopardized.

WARNING

No apnea monitoring takes place when flow monitoring is deactivated. Use an independent apnea monitoring.

CAUTION

Patient-triggered ventilation is not possible when flow monitoring with the neonatal flow sensor is deactivated.

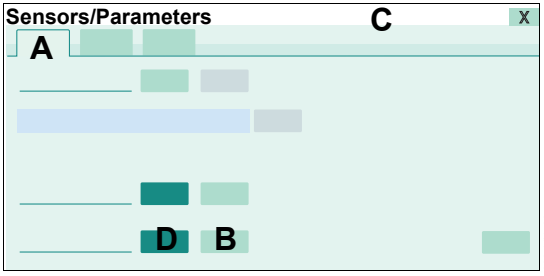
Flow monitoring can be deactivated, e.g.:
- If medication nebulization is being performed
- To permit ventilation in the event of major tube leakage
- If the flow sensor has failed but cannot be replaced immediately. If flow monitoring is not deactivated, a defective or disconnected flow sensor can lead to deviations in the minute and tidal volumes or to auto-triggering.

In the ***Neo.*** patient category, Babylog VN500 deactivates flow monitoring when changing to the ***NIV*** application mode.

Deactivating flow monitoring with neonatal flow sensor

1 Touch the ***Sensors/ Parameters...*** button in the main menu bar.

2 Touch the ***Neonatal flow sensor*** tab (A).



3 Touch the ***Off*** button (B) and confirm with the rotary knob.

Babylog VN500 displays the following information in the message field (C): ***External monitoring must be used!***

Flow monitoring with the neonatal flow sensor is deactivated. Babylog VN500 displays the ***Flow*** symbol in the header bar. The measured values are no longer displayed. The alarm function is deactivated.

Activating flow monitoring with neonatal flow sensor

Reactivate flow monitoring after exchanging the neonatal flow sensor or as soon as possible.

Prerequisite: The ***Neonatal flow sensor*** page (A) is opened.

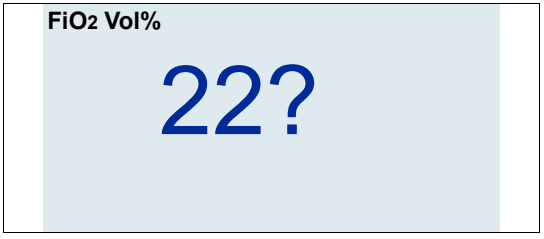
- Touch the ***On*** button (D) and confirm with the rotary knob.

Flow monitoring is activated.

O_2 monitoring

Calibrating the O_2 sensor

The O_2 sensor is calibrated during the device check. Regular calibration during the device check ensures the specified accuracy. If the O_2 sensor is not calibrated for 3 months, the accuracy of the O_2 sensor will be reduced. The parameter field for the O_2 concentration also displays a question mark in addition to the measured value.



After calibration during the device check the sensor will work again with full accuracy.

CAUTION

If the quality of the oxygen from the central gas supply system is not sufficient, calibrate the O_2 sensor with calibration gas (100 % O_2). Otherwise this may result in an incorrect calibration.

Additional information

"Performing the device check" on page 63.

The ***O_2 sensor*** page can be configured for direct access into the main menu bar as the ***O_2 sensor*** button. See "Assigning functions to additional buttons" on page 142.

The O_2 sensor is deactivated in standby mode. The O_2 concentration is only displayed 5 seconds after starting the therapy.

Deactivating or activating O_2 monitoring

WARNING

If O_2 monitoring is deactivated, ensure that an appropriate replacement monitoring function is available immediately. The patient may otherwise be jeopardized.

O_2 monitoring can be replaced by an appropriate replacement monitoring. Set the O_2 alarm limits for the replacement monitoring according to the set value FiO_2:

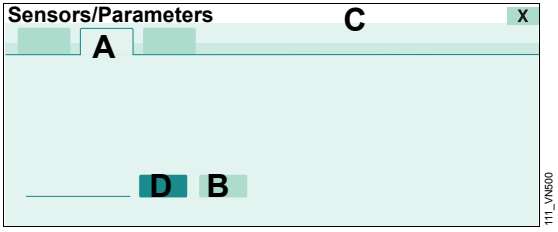
FiO_2 <60 Vol% –> O_2 ±4 Vol%

FiO_2 ≥60 Vol% –> O_2 ±6 Vol%

Deactivating O_2 monitoring

1 Touch the ***Sensors/ Parameters...*** button in the main menu bar.

2 Touch the ***O_2 sensor*** tab (A).



3 Touch the ***Off*** button (B) and confirm with the rotary knob.

Babylog VN500 displays the following information in the message field (C): ***External monitoring must be used!***

O_2 monitoring is deactivated. Babylog VN500 displays the ***FiO_2*** symbol in the header bar. The measured values are no longer displayed. The corresponding alarm function is deactivated.

Activating O_2 monitoring

O_2 monitoring should be reactivated as soon as possible.

Prerequisite: The ***O_2 sensor*** page (A) is opened.

- Touch the ***On*** button (D) and confirm with the rotary knob.

O_2 monitoring is activated.

CO_2 monitoring

Information on CO_2 monitoring

The ***CO_2 sensor*** page can be configured for direct access into the main menu bar as the ***CO_2 sensor*** button. See "Assigning functions to additional buttons" on page 142.

Selecting the cuvette type

The following cuvettes can be used:
– Reusable cuvettes
– Disposable cuvettes

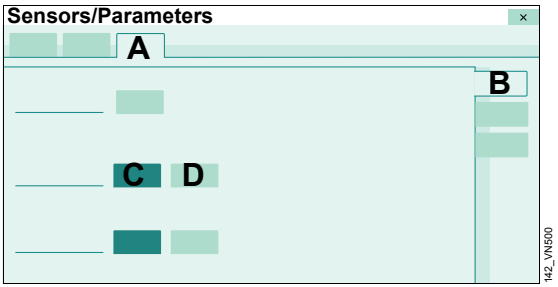
The cuvette type used must be selected on the ***Zero calib. on/off*** page.

CAUTION
The cuvette windows of the reusable cuvette have different optical properties to the cuvette windows of the disposable cuvette.
The cuvette type used must therefore be selected correctly on the ***Zero calib. on/off*** page.
Otherwise the zero point is shifted by up to 8 mmHg CO_2.

1 Touch the ***Sensors/ Parameters...*** button in the main menu bar.

2 Touch the ***CO_2 sensor*** tab (A).

The ***Zero calib. on/off*** page (B) appears by default.



3 Touch the ***Reusable*** (C) or ***Disposable*** (D) button and confirm with the rotary knob.

If the selected cuvette does not correspond to the cuvette used, the alarm message ***Check CO_2 cuvette*** is displayed.

Information on checking the CO_2 sensor

The CO_2 sensor is factory-calibrated and can be used on any Babylog VN500.

Information on checking the zero indication and zero calibration

When checking the zero indication or performing the zero calibration, the CO_2 concentration in the cuvette or in the cuvette slot of the sensor must not be higher than the background concentration of approximately 0.4 mmHg or 0.05 Vol%, which is the normal concentration in room air. For this reason, do not breathe on or into the cuvettes or into the cuvette slot.

The following checks are necessary for the CO_2 sensor:

Check	When required?
Check CO_2 zero indication in ambient air	Required before measurement and when changing the CO_2 sensor to another ventilation unit.
Perform a CO_2 zero calibration	When the CO_2 zero indication in ambient air is not between 0 and 1 mmHg (or 0 and 0.1 Vol%, or 0 and 0.1 kPa).
Check calibration of the CO_2 sensor with test filter	Required in intervals of one month.
Check calibration of the CO_2 sensor with test gas	When the test values are not adhered to during the calibration check with test filter.

Check	When required?
Perform calibration of the CO_2 sensor	When the test values are not adhered to during the calibration check with test gas.

Zero calibration in ambient air, calibration check with test filter or test gas and calibration of the CO_2 sensor can be performed during ventilation.

Information on the alarm messages issued during CO_2 monitoring

This information refers to the alarm messages which are generated due to a soiled cuvette or sensor.

Alarm message Clean CO_2 cuvette

If the ***Clean CO_2 cuvette*** message is displayed, the following panes may be soiled:
– Cuvette (disposable or reusable cuvette)
– CO_2 sensor

1 Clean the cuvette or use another cuvette.
  – When using reusable cuvettes, insert a clean reusable cuvette.
  – When using disposable cuvettes, insert a new disposable cuvette.

2 Clean the CO_2 sensor.

Alarm message CO_2 zero calibration?

If the ***CO_2 zero calibration?*** message is displayed or if incorrect measured values are suspected, e.g., etCO_2 values too low or inspiratory values too high, then proceed as follows:

1 Check whether the cuvette windows are soiled.

2 Clean the soiled windows. Or, if a reusable cuvette was used previously, use a clean reusable cuvette. If a disposable cuvette was used previously, use a new disposable cuvette.

If the cuvette windows are extremely soiled, e.g., deposits due to medication nebulization, this may result in a zero shift.

The CO_2 measured values may be incorrect even before insufficient measuring light causes the ***Clean CO_2 cuvette*** message to appear.

If the ***CO_2 zero calibration?*** message does not disappear or if the measured CO_2 values remain suspect, a zero calibration must be performed.

Checking the CO_2 zero indication

The check of CO_2 zero indication in ambient air is performed with a clean CO_2 sensor that is placed on the cuvette used for measurement.

Prerequisite: Babylog VN500 is switched on and at least the three-minute warm-up phase for the CO_2 sensor has elapsed. After 3 minutes, the measured CO_2 values will be inside the specified tolerance range.

1 Fit the CO_2 sensor on the cuvette.

2 Select the cuvette type, see page 129.

3 Display CO_2 measured values as a curve, see "Changing the display of monitoring fields" on page 84.

4 Remove the CO_2 sensor with the cuvette from the breathing circuit and hold in ambient air. Do not breathe on or into the cuvette.

  Instead of the cuvette from the breathing circuit, another clean cuvette of the selected type (disposable or reusable) can be used.

5 Observe the measured CO_2 value. If 0 to 1 mmHg (or 0 to 0.1 Vol% or 0 to 0.1 kPa) is not displayed in the ambient air, perform a zero calibration.

Performing a CO_2 zero calibration

Zero calibration is performed in ambient air and with a clean CO_2 sensor which is removed from the cuvette.

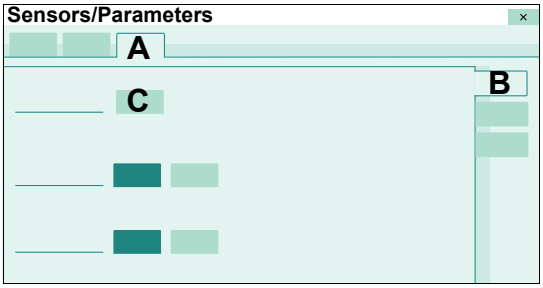
Prerequisite: Babylog VN500 is switched on and at least the three-minute warm-up phase for the CO_2 sensor has elapsed. After 3 minutes, the measured CO_2 values will be inside the specified tolerance range.

Starting zero calibration

1 Touch the ***Sensors/ Parameters...*** button in the main menu bar.

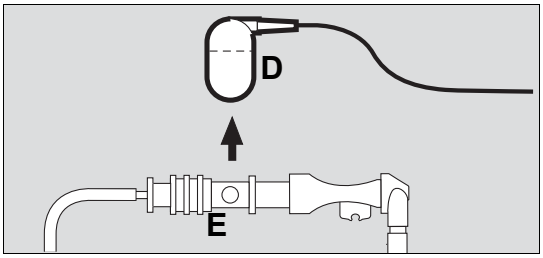
2 Touch the ***CO_2 sensor*** tab (A).

The ***Zero calib. on/off*** page (B) appears by default.



3 Touch the ***Start*** button (C).

When requested by Babylog VN500:



4 Remove CO_2 sensor (D) from the cuvette (E).

5 Confirm with the rotary knob.

Babylog VN500 performs the zero calibration and displays the message ***Calibration in progress.***

If zero calibration was successful

After approximately 5 seconds, Babylog VN500 reports ***Zero calibration successful.***

- Fit the CO_2 sensor (D) back on the cuvette (E).

If zero calibration was not successful

Babylog VN500 reports ***Zero calibration failed.***

- Repeat zero calibration.

If zero calibration is still impossible

1 Check whether the sensor is soiled and clean it if necessary. If the sensor is defective, replace it.

2 Repeat zero calibration.

Checking calibration of the CO_2 sensor with test filter

Perform the calibration check of the CO_2 sensor with test filter at intervals of one month.

Before the check

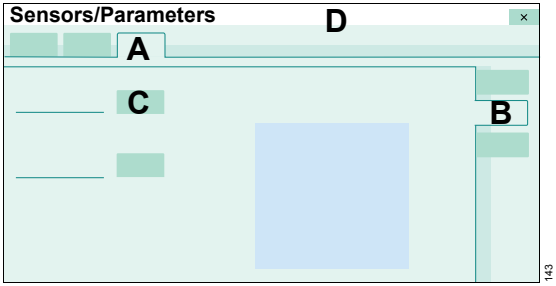
Prerequisite: Babylog VN500 is switched on and at least the three-minute warm-up phase for the CO_2 sensor has elapsed.

- Perform CO_2 zero calibration in ambient air.

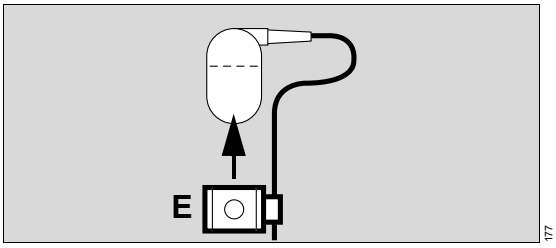
Starting the calibration check of the CO_2 sensor with test filter

Prerequisite: The ***CO_2 sensor*** page (A) is opened.

1 Touch the ***Check sensor*** tab (B).



2 Remove the sensor from the cuvette and connect it to the test filter (E) on the sensor cable.



3 Touch the ***Filter check*** button (C).

Babylog VN500 starts the check and displays the progress and result of the check in the message field (D).

If the check was successful

Babylog VN500 displays the message ***Filter check successful.*** The test value is within the permissible tolerance.

- Fit the CO_2 sensor back on the cuvette.

If the check was not successful

Babylog VN500 displays the message ***Filter check failed.*** The test value is outside the permissible tolerance.

- Check CO_2 calibration with test gas.

Checking calibration of the CO_2 sensor with test gas

Perform the check when the test values are not within the permitted tolerance during the calibration check of the CO_2 sensor with test filter.

CAUTION

For the check and calibration only use a test gas which consists of CO_2 and N_2! Otherwise display deviations of ±0.5 Vol% CO_2 may occur.

Before the check

Prerequisite: Babylog VN500 is switched on and at least the three-minute warm-up phase for the CO_2 sensor has elapsed.

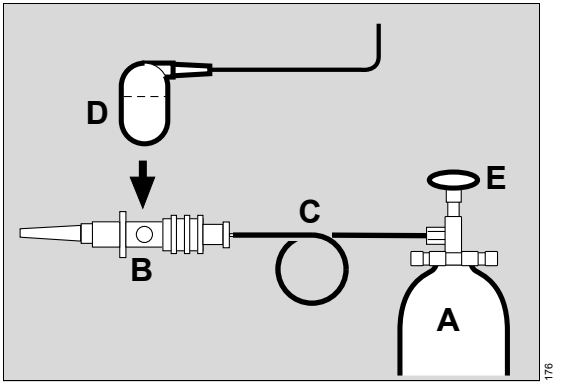
- Perform CO_2 zero calibration in ambient air.

Connecting the test gas supply

The test gas must only consist of CO_2 and N_2!

1 Use the reusable cuvette from the calibration set!

At the start of the check with test gas, Babylog VN500 automatically sets the cuvette type to ***Reusable***.



2 Connect the test gas cylinder (A) and the cuvette (B) of the calibration set to the hose (C).

3 Fit the CO_2 sensor (D) on the cuvette (B) of the calibration set.

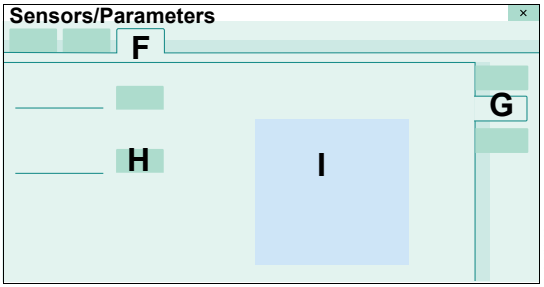
4 Read the CO_2 concentration of the test gas from the test gas cylinder (A).

5 Open the test gas cylinder (E) and set the test gas flow to 0.1 L/min.

Starting the calibration check of the CO_2 sensor with test gas

Prerequisite: The ***CO_2 sensor*** page (F) is opened.

1 Touch the ***Check sensor*** tab (G).



2 Touch the ***Gas check*** button (H) and confirm with the rotary knob.

Babylog VN500 displays the measured CO_2 concentration (I).

About 1 minute after the test gas flow has been set, the measured CO_2 value must match the CO_2 content of the test gas read from the test gas cylinder within ±0.2 Vol%.

Babylog VN500 terminates the check with test gas approx. 1 minute after start-up.

3 Close the test gas cylinder again.

If the test value is outside the permitted tolerance, the CO_2 sensor must be recalibrated with test gas.

After the calibration check of the CO_2 sensor with test gas

The cuvette type is automatically reset to the previously set cuvette type.

- Fit the CO_2 sensor back on the cuvette in the breathing circuit.

Performing calibration of the CO_2 sensor

The CO_2 sensor must be calibrated if the test values are not within the permitted tolerance during the calibration check with test gas.

CAUTION

For the check and calibration only use a test gas which consists of CO_2 and N_2! Otherwise display deviations of ±0.5 Vol% CO_2 may occur.

Before calibration

Prerequisite: Babylog VN500 is switched on and at least the three-minute warm-up phase for the CO_2 sensor has elapsed.

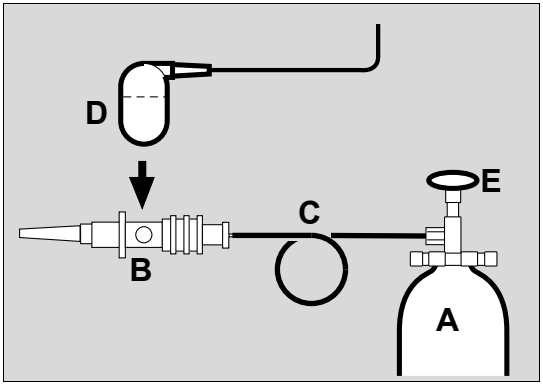
- Perform CO_2 zero calibration in ambient air.

Connecting the test gas supply

The test gas must only consist of CO_2 and N_2!

1 Use the reusable cuvette from the calibration set!

At the start of calibration, Babylog VN500 automatically sets the cuvette type to ***Reusable***.



2 Connect the test gas cylinder (A) and the cuvette (B) of the calibration set to the hose (C).

3 Fit the CO_2 sensor (D) on the cuvette (B) of the calibration set.

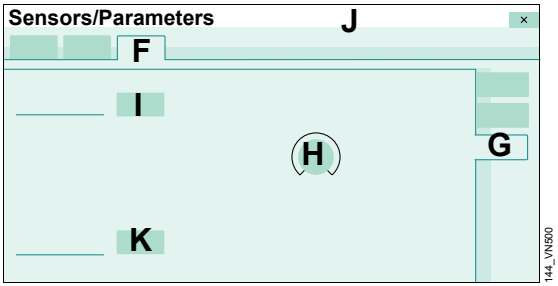
4 Read the CO_2 concentration of the test gas from the test gas cylinder (A).

5 Open the test gas cylinder (E) and set the test gas flow to 0.1 L/min.

Starting calibration of the CO_2 sensor with test gas

Prerequisite: The ***CO_2 sensor*** page (F) is opened.

1 Touch the ***Calibration*** tab (G).



2 Touch the therapy controls ***CO_2 sensor*** (H). Enter the value for the CO_2 test gas concentration with the rotary knob and confirm.

3 About 1 minute after setting the test gas flow, touch the ***Start*** button (I) and confirm with the rotary knob.

Babylog VN500 starts the calibration of the CO_2 sensor and displays the progress and result of the calibration in the message field (J).

4 Close the test gas cylinder again.

If calibration was successful

Babylog VN500 displays the message ***CO_2 sensor calib. with test gas successful.***

The cuvette type is automatically reset to the previously set cuvette type.

- Fit the CO_2 sensor back on the cuvette in the breathing circuit.

If calibration was not successful

Babylog VN500 displays the message ***Calibration of CO_2 sensor with test gas failed.***

If calibration failed, the following causes are possible:

Cause	Remedy
The entered CO_2 concentration does not match the value on the test gas cylinder.	Check the entered CO_2 concentration and repeat calibration of the CO_2 sensor.
The test gas cylinder is empty.	Use a new test gas cylinder and repeat calibration of the CO_2 sensor.
The CO_2 sensor is soiled.	Clean the CO_2 sensor and repeat calibration of the CO_2 sensor.
The CO_2 sensor is defective.	Exchange the CO_2 sensor and check the CO_2 zero indication.

Resetting the calibration of the CO_2 sensor

If problems occurred during calibration, the sensor can be reset to the delivery default values.

Prerequisite: The ***Calibration*** page is opened.

1 Touch the ***Reset calibration*** button (K).

After approximately 5 seconds, the factory-set calibration value is effective again and must be checked with the test filter.

2 Check the calibration of the CO_2 sensor with test filter, see page 131.

Deactivating or activating CO_2 monitoring

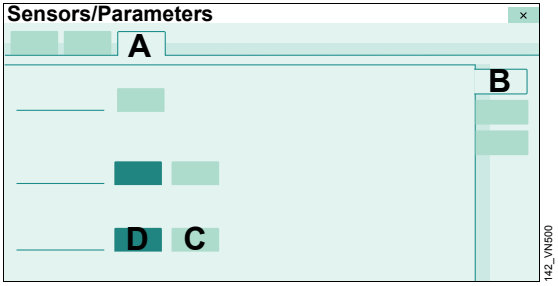
Deactivate CO_2 monitoring when a defective CO_2 sensor cannot immediately be exchanged or the CO_2 measured values are currently not needed.

Deactivating CO_2 monitoring

1 Touch the ***Sensors/ Parameters...*** button in the main menu bar.

2 Touch the ***CO_2 sensor*** tab (A).

3 Touch the ***Zero calib. on/off*** tab (B) if the page is not already preset.



4 Touch the ***Off*** button (C) and confirm with the rotary knob.

CO_2 monitoring is deactivated. Babylog VN500 displays the symbol in the CO_2 parameter field. The measured values are no longer displayed. The alarm function is deactivated.

Activating CO_2 monitoring

Prerequisite: The ***Zero calib. on/off*** page (B) is opened.

- Touch the ***On*** button (D) and confirm with the rotary knob.

CO_2 monitoring is activated.

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Configuration

Information on configuration

The ***System setup*** dialog window provides the user with the following configuration options:
– Screen layout
– Alarms
– Ventilation
– Config. exchange (Importing and exporting configurations)
– Applications
– Exchange intervals
– System

To prevent unauthorized adjustments, the following pages are password-protected:
– Screen layout > Views
– Alarms
– Ventilation
– Applications
– Exchange intervals

The password only needs to be entered once as long as the ***System setup*** dialog window remains open.

For additional information on the password, see page 287.

Configuring the screen display

The following settings can be configured on the ***Screen layout*** page:
– General settings (General settings)
– Views
– Customized data (Customized data)
– Config. buttons (Configurable buttons)
– Trends graphic 1
– Trends graphic 2
– Therapy bar

The customized settings for Trends graphic 1 and Trends graphic 2 become effective with the admission of a new patient. The other customized screen display settings are immediately effective.

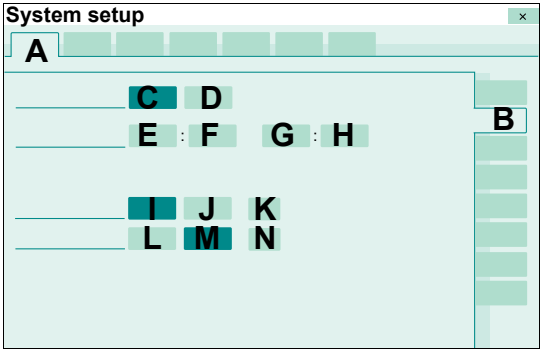
- Touch the button ***System setup...***.

Babylog VN500 opens the ***System setup*** dialog window. The ***Screen layout*** page appears by default.

Adjusting lighting and brightness

Prerequisite: The ***Screen layout*** page (A) is opened.

1 Touch the ***General settings*** tab (B).



Automatic changeover of day and night mode

If the automatic changeover of day and night mode is switched on, the system will automatically change over the following settings:
– Lighting of the screen
– Volume of the alarm tone
– Automatic increase of the alarm tone volume

- Touch the ***On*** (C) or ***Off*** (D) button.

Selecting the time period for screen lighting at night

The lighting of the screen is reduced with a dark background color for the time period entered.

Hours (E) : minutes (F) to hours (G) : minutes (H).

1 Touch the appropriate button.

2 Set the time by turning the rotary knob and push to confirm.

If the automatic changeover for the lighting of the screen is switched on, the system will change over at the times entered.

The ***Day/Night*** button in the main menu bar can be configured to enable direct access to the reduced lighting mode that uses a dark background color, see page 142.

Adjusting screen brightness

The screen brightness can be adjusted automatically or manually.

Activating automatic brightness adjustment:

- Touch the ***Automatic*** button (I).

Adjusting brightness manually:

1 Touch the ***Manual*** button (J).

2 Touch the (K) button.

3 Set the value by turning the rotary knob and push to confirm.

Adjusting automatic screen dimming

Automatic dimming of the screen can be set for standby mode and battery operation.

1 Touch the ***On*** button (L).

2 Touch the (N) button.

3 Set the value by turning the rotary knob and push to confirm.

Switching off automatic screen dimming:

- Touch the ***Off*** button (M).

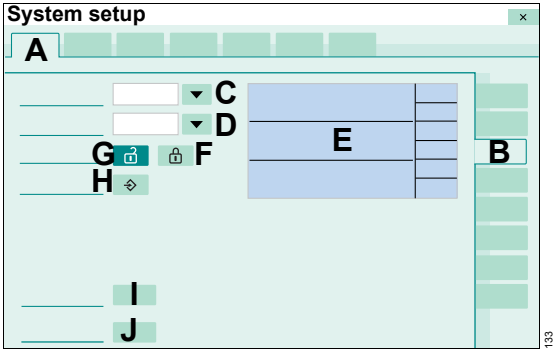
Configuring the screen view

Prerequisite: The ***Screen layout*** page (A) is opened.

1 Touch the ***Views*** tab (B).

2 Enter password and confirm with ***Enter***.

The ***Views*** page is displayed.



Selecting the view

3 Touch the ▼ button (C).

Babylog VN500 opens the selection list for the views. 3 views can be configured (***View 1*** to ***View 3***).

4 Select the respective view by turning the rotary knob and push to confirm.

Selecting the format template

The format templates can only be selected if the selected view is not locked. The button (G) is dark green.

5 Touch the ▼ button (D).

Babylog VN500 opens the selection list containing the existing format templates.

6 Select the desired template by turning the rotary knob and push to confirm.

The selected format template is displayed (E).

Adjusting the selected view

7 Touch a field in the view (E).

The dialog for the field contents is displayed.

8 Select the parameter, display format and display size for curves and parameter fields. See "Changing the display of monitoring fields" on page 84.

Locking the view against overwriting

- Touch the button (F).

The selected view is locked and cannot be changed. The display of the monitoring fields cannot be changed on the main page.

Deactivating the lock

- Touch the button (G).

Saving the view

1 Touch the button (H).

2 Confirm with the rotary knob.

The current view for the selected view (***View 1*** to ***View 3***) is saved.

Reset current view

Each view can be reset individually, either to factory or saved settings. The view must not be locked.

Loading factory settings

1 Touch the ***Dräger default*** button (I).

2 Confirm with the rotary knob.

For information on the factory settings for the views, see chapter "Factory-set screen views" on page 281.

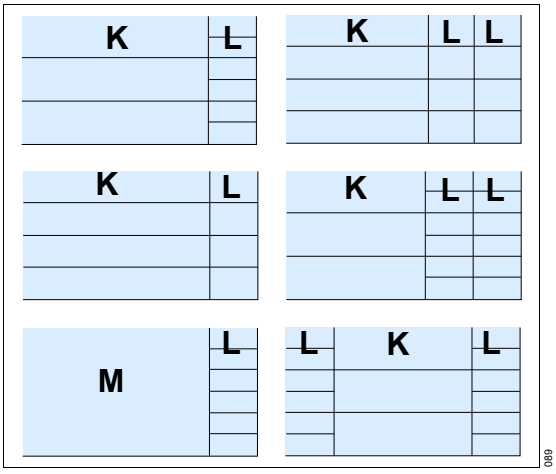
Loading saved settings

1 Touch the ***Load*** button (J).

2 Confirm with the rotary knob.

Overview of format templates

The following format templates are available for selection:



The (K), (L) and (M) fields can be configured with customized settings. The following settings are possible:

K		L		M
Field size ***1x***	Field size ***2x***	Field size ***1x***	Field size ***2x***	
Waveform	Waveform	Single parameter	Single parameter	Single parameter
Trends (meas.)	Loop	Double parameter	Parameter groups	Double parameter
Trends (settings)	Double loop	Trends (meas.)	Loop	Parameter groups
Trends table	Trends (meas.)	Trends (settings)	Trends (meas.)	Waveform
Multi Trend	Trends (settings)		Trends (settings)	Loop
Alarm history	Trends table			Double loop
	Multi Trend			Trends (meas.)
	Alarm history			Trends (settings)
	Lung display (Smart Pulmonary View)			Trends table
				Multi Trend
				Alarm history
				Lung display (Smart Pulmonary View)

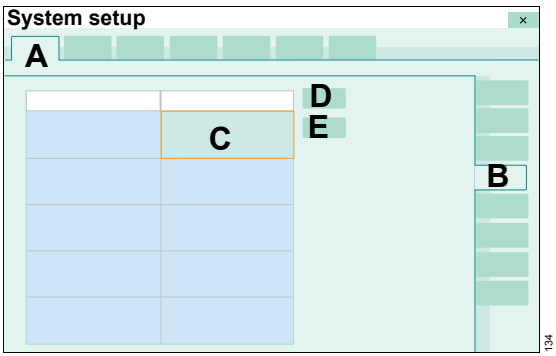
All fields can also be configured without contents.

Configuring the display of hospital-specific measured values and settings

A maximum of 20 measured and setting values can be grouped together. The hospital-specific measured and setting values are displayed on the ***Trends/Data > Values > Customized data*** page.

Prerequisite: The ***Screen layout*** page (A) is opened.

1 Touch the ***Customized data*** tab (B).



Selecting a row in the list

- Turn the rotary knob until the desired row is marked in column 1 or 2 (C) or touch the row.

Configuring the display of hospital-specific measured values

Prerequisite: The desired row is marked.

1 Touch the ***Values*** button (D).

2 Select the parameter from the selection list with the rotary knob and push to confirm.

Configuring the display of hospital-specific setting values

Prerequisite: The desired row is marked.

1 Touch the ***Settings*** button (E).

2 Select the parameter from the selection list with the rotary knob and push to confirm.

Additional information

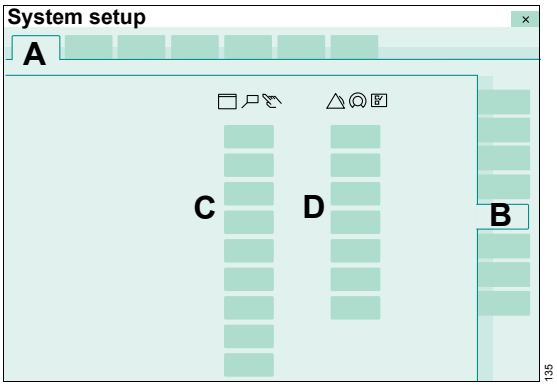
Measured values are displayed in the list with a blue background color and setting values with a green background color.

Assigning functions to additional buttons

Additional buttons can be assigned in the main menu bar to enable direct access to a function or to directly open a page. The buttons are spatially assigned to the corresponding group.

Prerequisite: The ***Screen layout*** page (A) is opened.

1 Touch the ***Config. buttons*** tab (B).



In the first column (C), the buttons can be selected for the left column of the main menu bar. In the second column (D), the buttons can be selected for the right column of the main menu bar.

2 Touch the button.

3 Select the desired button from the selection list with the rotary knob and push to confirm.

Babylog VN500 displays the selected button in the main menu bar.

Additional information

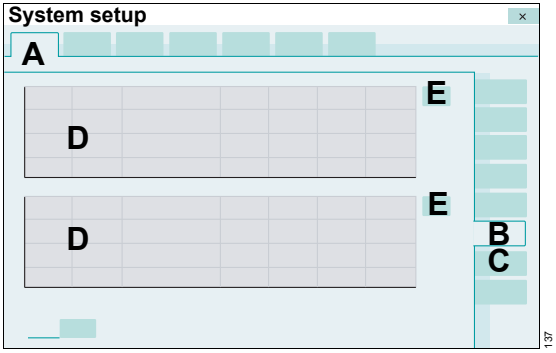
For information on the display of additional buttons and their spatial assignment in the main menu bar, see "Main menu bar structure" on page 277.

Selecting parameters for the graphic trend display

The graphic trend display for the ***Trends/Data > Trends > Graphics 1*** and ***Graphics 2*** pages can be configured. The settings become effective with the admission of a new patient.

Prerequisite: The ***Screen layout*** page (A) is opened.

1 Touch the ***Trends graphic 1*** (B) or ***Trends graphic 2*** (C) tab.

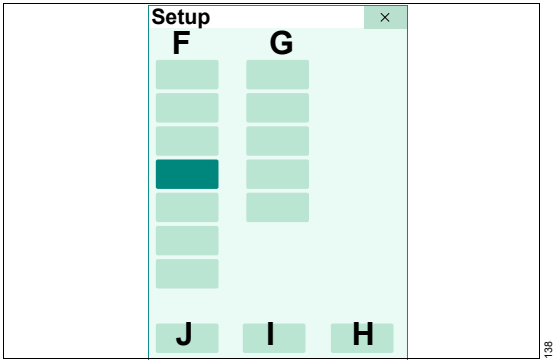


Each page contains 2 graphic trend displays (D). A maximum of 3 parameters can be configured for each trend display.

Configuring the trend display

1 Touch the ✎ button (E).

Babylog VN500 opens the ***Setup*** dialog with the buttons for ***Meas.*** (F) and ***Settings*** (G).

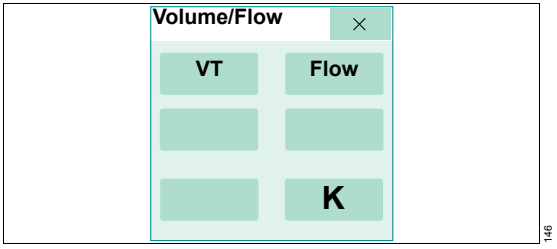


The measured values (F) are divided into the following parameter types:
– Pressures
– Minute vol.
– Volume/Flow
– Gases
– Timing/Cycl.
– Others
– Events

The settings (G) are divided into the following parameter types:
– Pressures
– Volume/Flow
– Gases
– Timing/Cycl.
– Others

2 Touch the appropriate button for measured values or setting values.

Babylog VN500 opens another dialog containing all the parameters of the selected parameter type (example ***Volume/Flow***).



3 Touch the parameter. The button turns dark green.

4 Confirm with the ***OK*** button (K).

The dialog for the parameter type is closed.

A maximum of 3 parameters can be selected for each graphic trend display.

5 Select further parameters according to step 2 to 4.

6 Confirm the selected measured values and set values with the ***OK*** button (H).

The selected parameters are displayed in the trend display. The ***Setup*** dialog is closed.

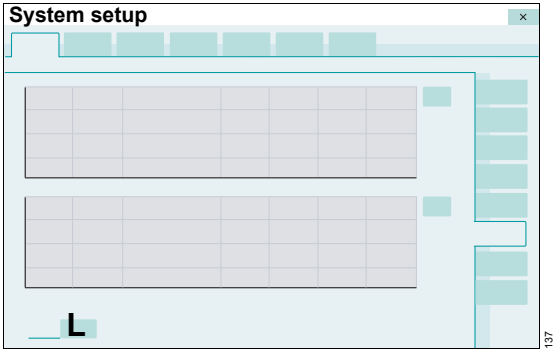
The selection can be aborted with ***Cancel*** (I). The previous selection is displayed in the graphic trend.

Clear (J) can be used to delete all parameter selections made.

Deselecting a parameter in the trend display

- Touch the parameter to be deselected in the parameter type dialog. The button turns pale green.

Selecting a time interval



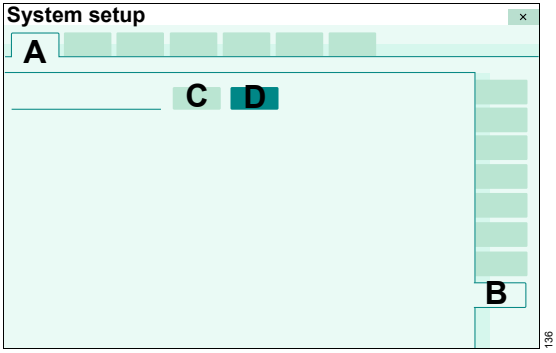
7 Touch the button (L). Select the time interval from the selection list: 2, 4, 8, 12 hours, 1 day, 7 days.

Locking of therapy controls in therapy bar

The therapy controls in the therapy bar can be locked to prevent accidental changes from being made to the ventilation parameters.

Prerequisite: The ***Screen layout*** page (A) is opened.

1 Touch the ***Therapy bar*** tab (B).



2 Touch the ***On*** button (C).

The therapy controls in the therapy bar are locked. The ventilation parameters can only be changed in the ***Ventilation settings*** dialog window.

Canceling the lock

- On the ***Therapy bar*** page, touch the ***Off*** button (D).

Configuring alarm settings

The customized settings for the start-up values of the alarm limits become effective with the admission of a new patient. The customized alarm tone settings are effective immediately depending on the time of day. The selection of the alarm tone sequence is effective immediately.

1 Touch the ***System setup...*** button in the main menu bar.

2 Touch the ***Alarms*** tab.

3 Enter password and confirm with ***Enter***.

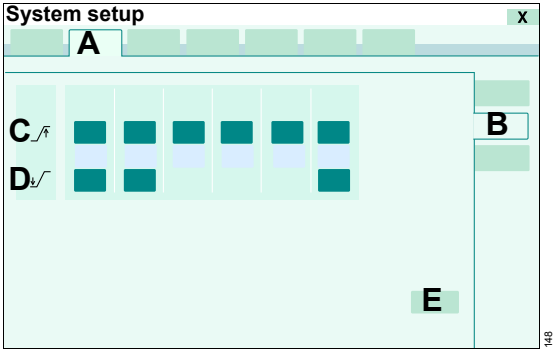
Babylog VN500 displays the following configurable alarm settings in the overview:
– Start-up values for alarm limits
– Alarm volume and alarm tone

Setting start-up values for alarm limits

CAUTION
If several devices of the same type are used on a ward, the alarm defaults must be configured identically on all devices. The patient may otherwise be jeopardized.

Prerequisite: The ***Alarms*** page (A) is opened.

1 Touch the ***Preset limits*** tab (B).



Babylog VN500 displays the start-up values used for the alarm limits.

(C) upper alarm limit

(D) lower alarm limit

2 Touch the relevant button for the alarm limit.

3 Set the value by turning the rotary knob and push to confirm.

Selecting the factory settings

- Touch the ***Dräger default*** button (E) and confirm with the rotary knob.

The ***Dräger default*** button also resets other start-up settings on the ***Ventilation*** page and the ***Alarms*** page to the factory settings.

Table of alarm limits

The following table lists the alarm limits with the setting range and the factory-set start-up values (Dräger default). The hospital-specific start-up values can be entered in the table.

Parameter	Setting range	Factory-set start-up value (*Dräger default*)	Hospital-specific set start-up value
MV	1 to 100 %	(VT x RR) +50 %	
MV	Off, 1 to 100 %	(VT x RR) –20 %	
MV delay	0 to 20 seconds	0 seconds	
MV delay	0 to 20 seconds	0 seconds	
Paw	7 to 105 mbar (7 to 105 cmH_2O)	30 mbar (30 cmH_2O)	
RR	1 to 100 %, Off	RR +20 %	
Tapn	5 to 60 seconds	15 seconds	
$etCO_2$	0.1 to 13.1 Vol%	8.0 Vol%	
	1 to 98 mmHg	60 mmHg	
	0.1 to 13.3 kPa	–	
$etCO_2$	0 to 13.0 Vol%	4.0 Vol%	
	0 to 97 mmHg	30 mmHg	
	0 to 13.2 kPa	–	

Additional information

The alarm limits for the minute volume are set as a percentage of the start-up value (VT x RR). Configuring RR, see "Configuring start-up settings for the ventilation parameters" on page 150.

For an overview of device's internal alarm limits, see chapter "Automatic alarm limits" on page 238.

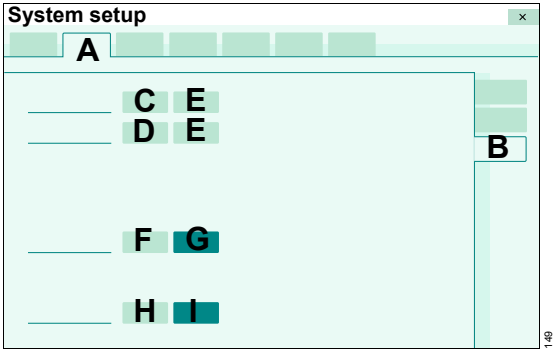
Setting the alarm tone

WARNING

The volume of the acoustic alarm must be set loud enough to ensure that an alarm can be heard!

Prerequisite: The ***Alarms*** page (A) is opened.

1 Touch the ***Alarm vol./tone*** tab (B).



Setting volume

2 For the day setting, touch the button (C).

3 Set the value for the sound level by day by turning the rotary knob and push to confirm.

4 For the night setting, touch the button (D).

5 Set the value for the sound level by night by turning the rotary knob and push to confirm.

Activating the automatic sound level increase

The ***Auto increase*** function can be set separately for day and night.

- Touch the ***Auto increase*** button (E).

Selecting alarm tone sequences

Babylog VN500 offers the following alarm tone sequences:

(F)	***IEC/CEI***	as per IEC 60601-1-8
(G)	***Dräger ventilation***	usual alarm tone sequences of Dräger ventilators

- Touch the appropriate button.

Setting the priority of the battery alarm

The ***Battery activated*** alarm message indicating the changeover to battery operation can be configured as a high- or medium-priority alarm.

- Touch the ***Medium*** (H) or ***High*** (I) button and confirm.

Configuring ventilation settings

The following ventilation configurations are possible:
– Configuration of patient category for start-up
– Configuration of main ventilation modes
– Configuration of start-up ventilation settings
– Configuration of general settings for ventilation
– Configuration of settings for maneuvers

The customized ventilation settings become effective with the admission of a new patient.

1 Touch the ***System setup...*** button in the main menu bar.

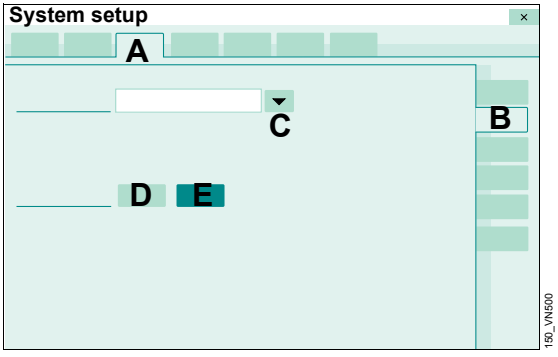
2 Touch the ***Ventilation*** tab.

3 Enter password and confirm with ***Enter***.

Configuring start-up settings for the patient category

Prerequisite: The ***Ventilation*** page (A) is opened.

1 Touch the ***Patient category*** tab (B).



2 Touch the ▼ button (C).

Babylog VN500 opens the selection list. The following patient categories are available for selection:
– ***Pediatric patients only***
– ***Pediatric patients, neonates***
– ***Neonates only***

3 Select the patient category with the rotary knob and push to confirm.

Babylog VN500 displays the buttons for the selected patient category on the ***Start*** and ***Start/Standby*** pages.

Configuring a user-defined breathing circuit

When the ***User-defined hose settings*** function is activated, a user-defined breathing circuit can be selected on the ***Start/ Standby... > Br. circuit/ Humidifier*** page.

Activating a user-defined breathing circuit:

- Touch the ***On*** button (D).

Deactivating a user-defined breathing circuit:

- Touch the ***Off*** button (E).

Additional information

Using the user-defined breathing circuit, see page 62.

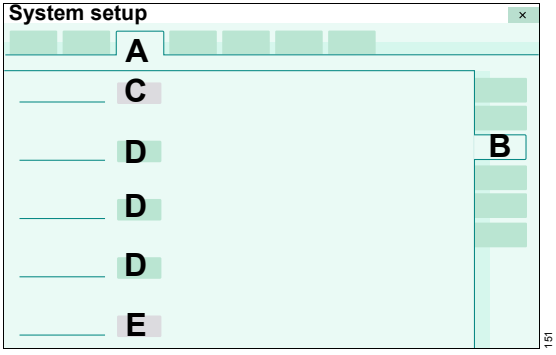
Configuring start-up settings for the ventilation modes

CAUTION

If the ventilation start-up values are configured differently to the Dräger standard values, this configuration must be identical on all Babylog VN500 belonging to a ward. The patient may otherwise be jeopardized.

Prerequisite: The ***Ventilation*** page (A) is opened.

1 Touch the ***Modes*** tab (B).



Babylog VN500 displays the start mode (C) and 3 ventilation modes (D). These ventilation modes are displayed in the ***Ventilation settings*** dialog window after Babylog VN500 has been started.

The ventilation mode (E) configured under ***Other modes*** is displayed as an additional mode for information purposes and can be changed in the ***Ventilation settings*** dialog window.

2 Touch the appropriate button.

Babylog VN500 opens the ventilation mode selection list.

3 Select the mode with the rotary knob and push to confirm.

If **---** is configured for a ventilation mode, the corresponding page is not available in the ***Ventilation settings*** dialog window.

The same ventilation mode cannot be configured on 2 buttons.

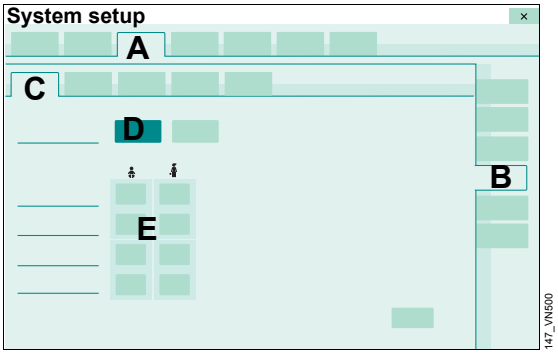
The button with the active ventilation mode is highlighted in gray and cannot be changed. The button assignment can only be changed when another ventilation mode is activated in the ***Ventilation settings*** dialog window.

Depending on configuration, the number of displayed ventilation modes can vary between 1 and 4.

Configuring start-up settings for the ventilation parameters

Prerequisite: The ***Ventilation*** page (A) is opened.

1 Touch the ***Start settings*** tab (B).



Babylog VN500 displays the following pages for the ventilation start-up settings:
– VT, RR, Trigger
– Pressures, O_2, I:E
– Other settings
– ATC

The ***VT, RR, Trigger*** page (C) appears by default.

Setting start-up values for VT, RR, Slope and Flow trigger

Depending on the patient category or the patient's weight, these start-up values can be set:
– VT
– RR
– Slope
– Flow trigger

Setting start-up values depending on the patient category

1 If not yet preset, touch the ***Patient*** button (D) and confirm with the rotary knob.

Babylog VN500 displays the start-up values for the different patient categories (E).

2 Touch the appropriate button (E).

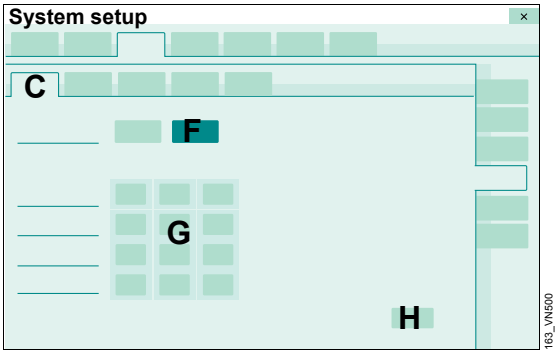
3 Set the value by turning the rotary knob and push to confirm.

After the start of ventilation, Babylog VN500 begins ventilation with the start-up values, dependent on the patient category set on the ***Start/Standby*** page.

Setting start-up values depending on the body height/weight

Prerequisite: The ***VT, RR, Trigger*** page (C) is opened.

1 Touch the ***Weight*** button (F) and confirm with the rotary knob.



Babylog VN500 displays the start-up values for the different body weights (G).

2 Touch the appropriate button (G).

3 Set the value by turning the rotary knob and push to confirm.

After the start of ventilation, Babylog VN500 begins ventilation with the start-up values, depending on the body height set on the ***Start/Standby*** page and the ideal body weight derived from that, or with the set start-up body weight in the ***Neo.*** patient category.

Selecting the factory settings

- Touch the ***Dräger default*** button (H) and confirm with the rotary knob.

The ***Dräger default*** button also resets other start-up settings on the ***Ventilation*** page and the ***Alarms*** page to the factory settings.

Tables for start-up values

The following tables show the factory-set start-up values (Dräger default) for ***VT***, ***RR***, ***Slope*** and ***Flow trigger***. The hospital-specific start-up values can be entered in the table.

The following table applies to the selection of start-up values depending on the patient category:

	Factory-set start-up value				Hospital-specific set start-up value			
Patient category	**VT** (mL)	**RR** (1/min)	**Slope** (s)	**Flow trigger** (L/min)	**VT** (mL)	**RR** (1/min)	**Slope** (s)	**Flow trigger** (L/min)
Neo.	5.0	60	0.1	0.3				
Ped. pat.	50	29	0.2	1.0				

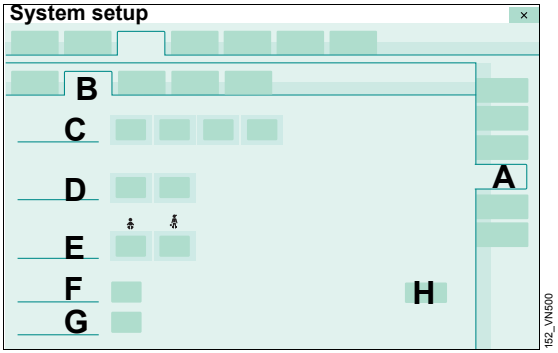
The following table applies to the selection of start-up values depending on the body weight according to the Radford nomogram:

	Factory-set start-up value				Hospital-specific set start-up value			
Weight (kg)	**VT** (mL)	**RR** (1/min)	**Slope** (s)	**Flow trigger** (L/min)	**VT** (mL)	**RR** (1/min)	**Slope** (s)	**Flow trigger** (L/min)
0.5	3.0	100	0.05	0.2				
5	36	32	0.2	1.0				
15	110	26	0.2	1.0				

Setting start-up values for pressures, FiO_2 and I:E

Prerequisite: The ***Start settings*** page (A) is opened.

1 Touch the ***Pressures, O_2, I:E*** tab (B).



2 Touch the corresponding button for the parameters:
- ***Pressures*** (C)
- ***APRV pressures*** (D)
- ***Insp. flow*** (E)
- ***FiO_2*** (F)
- ***I:E*** (G)

3 Set the value by turning the rotary knob and push to confirm.

Selecting the factory settings

- Touch the ***Dräger default*** button (H) and confirm with the rotary knob.

The ***Dräger default*** button also sets other start-up settings on the ***Ventilation*** page and the ***Alarms*** page to the factory settings.

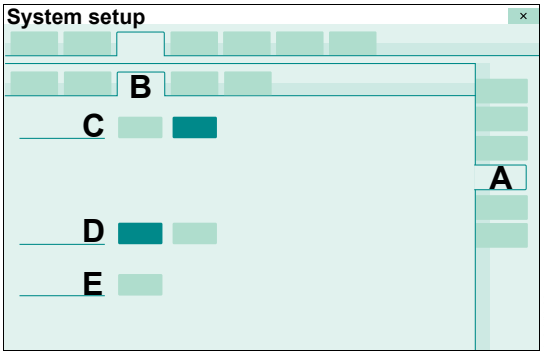
Parameter	Factory-set start-up value (*Dräger default*)	Hospital-specific set start-up value
PEEP	5 mbar (5 cmH_2O)	
ΔPsupp	0 mbar (0 cmH_2O)	
Pinsp	15 mbar (15 cmH_2O)	
Pmax	40 mbar (40 cmH_2O)	
Plow	5 mbar (5 cmH_2O)	

Parameter	Factory-set start-up value (*Dräger default*)	Hospital-specific set start-up value
Phigh	15 mbar (15 cmH2O)	
Insp. flow	Patient category ***Neo.***: 6 L/min	
	Patient category ***Ped. pat.***: 10 L/min	
FiO2	21 Vol%	
I:E	1:2	

Defining the start-up setting of the additional settings

Prerequisite: The ***Start settings*** page (A) is opened.

1 Touch the ***Other settings*** tab (B).



The following settings can be switched on or off:
– ***Volume Guarantee*** (C)
– ***Apnea Ventilation*** (D)

2 Touch the ***On*** or ***Off*** button.

3 Confirm with the rotary knob.

A start-up value can be set for the expiratory termination criterion ***Exp. term.*** (E):

4 Touch the (E) button.

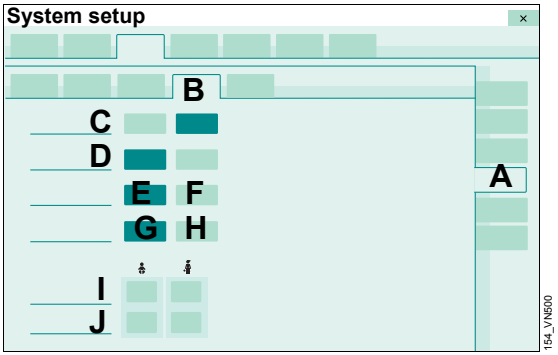
5 Set the value by turning the rotary knob and push to confirm.

If the ***Dräger default*** button is touched on another page, e.g., the ***Ventilation > Start settings*** page or the ***Alarms*** page, the settings are also set to the factory settings.

Defining start-up settings for tube compensation

Prerequisite: The ***Start settings*** page (A) is opened.

1 Touch the ***ATC*** tab (B).



The following settings can be switched on or off:
– ***Tube comp. (ATC)*** (C)
– ***Expiratory compensation*** (D)

2 Touch the ***On*** or ***Off*** button and confirm with the rotary knob.

Inspiratory compensation can be selected for spontaneous and mandatory or only spontaneous breaths:
– ***Spon+mand*** (E)
– ***Only spon*** (F)

3 Touch the appropriate button and confirm with the rotary knob.

In the ***Ped. pat.*** patient category, select the tube type:

4 Touch the ***ET*** (G) or ***Trach.*** (H) button and confirm.

Enter the tube diameter (I) according to the selected tube type:
– ***ET***: 2 to 8 mm
– ***Trach.***: 2.5 to 8 mm

In the ***Neo.*** patient category, only the ***ET*** tube type (G) is available.

Enter the tube diameter (I):
– ***ET***: 2 to 5 mm

5 Touch the relevant button for the patient category.

6 Set the value for the tube diameter by turning the rotary knob and push to confirm.

Enter degree of compensation (J) for the respective patient category: 0 to 100 %

7 Touch the relevant button for the patient category.

8 Set the value for the degree of compensation by turning the rotary knob and push to confirm.

Babylog VN500 starts with the start-up settings selected for the ventilation parameters.

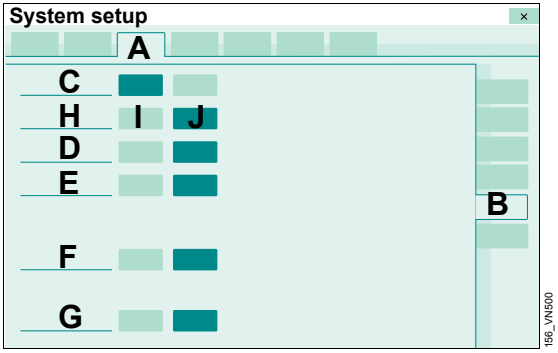
The customized settings for inspiratory and expiratory compensation are immediately effective when ***ATC*** is set.

When touching the ***Dräger default*** button, the settings for inspiratory and expiratory compensation are also set to the factory settings.

Configuring general settings

Prerequisite: The ***Ventilation*** page (A) is opened.

1 Touch the ***General settings*** tab (B).



The following settings can be switched on or off:
– ***Leakage Compensation*** (C)
– ***Automatic return from Apnea Ventilation*** (D)
– ***Apnea Ventilation alarm*** (E)
– ***Pmax/Paw high autoset*** (F)
– ***Anti Air Shower*** (G)

2 Touch the ***On*** or ***Off*** button as appropriate and confirm with the rotary knob.

Slope adjustment Select (H):
– ***Slope*** (I)
– ***Insp. flow*** (J)

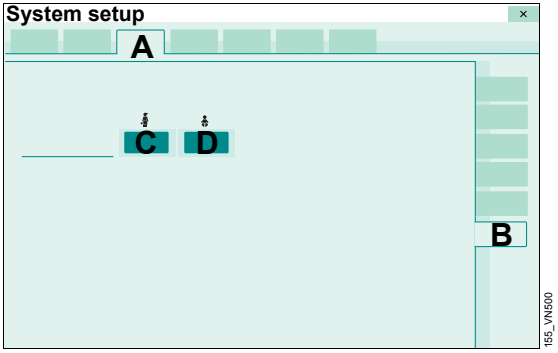
3 Touch the appropriate button and confirm with the rotary knob.

Babylog VN500 starts with the selected settings.

Setting a maneuver

Prerequisite: The ***Ventilation*** page (A) is opened.

1 Touch the ***Maneuver*** tab (B).



Setting the FiO_2 concentration for the suction maneuver

For the suction maneuver, FiO_2 is set based on the current FiO_2 concentration using a factor between 1.0 and 2.0.

2 Touch the (C) or (D) button.

3 Set the factor by turning the rotary knob and push to confirm.

Babylog VN500 starts with the selected start-up settings.

Importing and exporting configurations

Babylog VN500 can export the device configuration to a USB storage medium. The configuration saved on the USB storage medium can be imported to other devices.

The following settings from the system configuration are exported and imported:

Screen layout	General settings	
	Views[1)]	
	Customized data	
	Config. buttons	
	Trends graphic 1	
	Trends graphic 2	
	Therapy bar	
Alarms	Preset limits	
	Alarm vol./tone	
Ventilation	Patient category	
	Modes	
	Start settings	VT, RR, Trigger
		Pressures, O_2, I:E
		Other settings
		ATC
	General settings	
	Maneuver	
Exchange intervals		
System	Country	
	Units	
	Interface	LAN
		COM
		External display

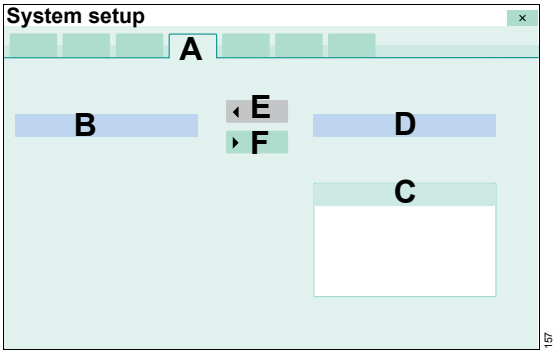
1) Views are only exported if the view configured was first saved on the ***Screen layout*** page. When a configuration is imported, all the current views are overwritten, including the locked views.

Preparing the configuration exchange

- Insert the USB storage medium into a USB port on Infinity C500.

1 Touch the ***System setup...*** button in the main menu bar.

2 Touch the ***Config. exchange*** tab (A).



B Configuration on the device with the date of export

C Existing configurations on the USB storage medium

D Selected configuration on the USB storage medium with the date of export

Importing a configuration from a USB storage medium to the device

A configuration can only be imported in standby mode.

1 Switch Babylog VN500 to standby mode.

2 Select a configuration from the USB storage medium (C).

3 Touch the ◀ ***Import*** button (E).

4 Confirm with the rotary knob.

If there is no valid configuration saved on the USB storage medium, the system issues a message.

After the import, Babylog VN500 is switched off automatically.

5 Switch on Babylog VN500 again.

Babylog VN500 reports the completion of the configuration with a low-priority alarm.

6 Check the settings of the imported configuration.

Exporting a configuration from the device to a USB storage medium

1 Touch the ▶ ***Export*** button (F).

2 Confirm with the rotary knob.

If the USB storage medium already contains a configuration, a message appears stating that this configuration will be overwritten.

No export is possible onto the USB storage medium if it is full. The ▶ ***Export*** button (F) is grayed out and cannot be activated.

Installing applications

Babylog VN500 can be supplemented with additional Dräger applications. The applications are installed with a SIM card.

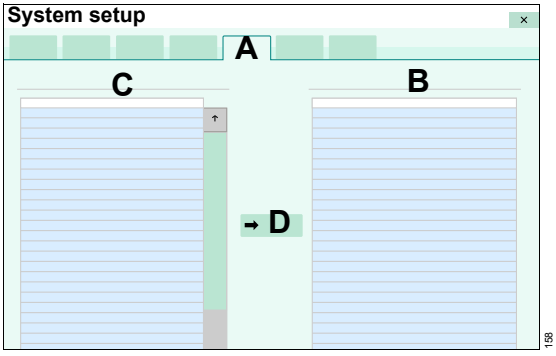
1 Insert the SIM card into the USB SIM card reader.

2 Insert the USB SIM card reader into a USB port on Infinity C500.

3 Touch the ***System setup...*** button in the main menu bar.

4 Touch the ***Applications*** tab (A).

5 Enter password and confirm with ***Enter***.



Babylog VN500 displays the already installed applications (B) and the applications available on the SIM card (C).

Installing applications

1 Touch the ***Install*** button (D).

2 Select the application from the (C) list with the rotary knob and push to confirm.

The installed application is displayed in the (B) list.

3 Install the next applications (repeat steps 1 to 3).

4 After all applications are installed, restart Babylog VN500.

Additional information

The ***Applications*** page can be configured as a button in the main menu bar for direct access. See "Assigning functions to additional buttons" on page 142.

Exchange intervals

The user can configure how much of the service life elapses before Babylog VN500 displays a message indicating that the next exchange of an accessory is due. This depends on the device type and software version.

The exchange interval must be defined in accordance with the applicable hygiene guidelines or in accordance with the specifications of the corresponding accessory's Instructions for Use.

WARNING

Risk of inappropriate operating life

Exchange monitoring only considers the absolute operating time and not the current status of the Infinity ID accessory and therefore does not release the user from periodic checks of the accessory.

The exchange interval which can be set for the exchange monitoring does not represent a guarantee for the maximum operating life of the accessory.

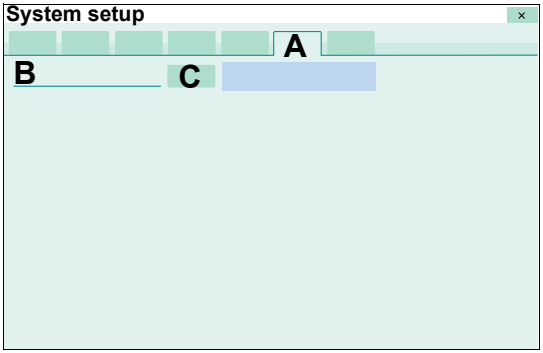
WARNING

Disposable articles were developed, tested and manufactured for disposable use only. Disposable articles must not be reused, reprocessed, or sterilized. Reuse, reprocessing or sterilization can lead to a failure of the accessories and cause injuries to the patient.

1 Touch the ***System setup...*** button in the main menu bar.

2 Touch the ***Exchange intervals*** tab (A).

3 Enter password and confirm with ***Enter***.



The exchange interval and the service life already elapsed for the relevant accessory (B) are displayed.

Setting the exchange intervals

4 Touch the (C) button.

5 Set the value by turning the rotary knob and push to confirm.

The settings are effective immediately.

No display of exchange intervals

- Touch the (C) button. Set ***Off*** by turning the rotary knob and push to confirm.

Additional information

Babylog VN500 displays the remaining service life for the accessories on the ***Start/Standby > Accessory status*** page.

Sterilization of the expiratory valve or inspiratory valve may gradually impair the operation of RFID transmission. This may mean that Infinity ID breathing circuit functions may not work or may no longer work reliably. The service life for the Infinity ID accessories is displayed with **---**.

System settings

The following system settings can be configured:
– Country
– Units
– Interface (interfaces)
– Supply units (supply units)
– Service

The customized settings are immediately effective.

1 Touch the button ***System setup...***.

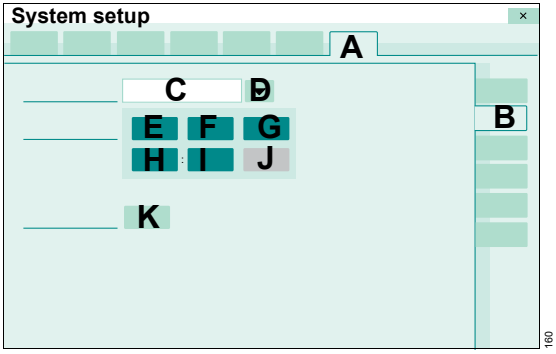
2 Touch the ***System*** tab.

Babylog VN500 displays the following configurable settings in an overview:
– Language, date and time
– Units for measured values and settings
– Network and serial interfaces
– GS500
– Service information

Selecting country-specific settings

Prerequisite: The ***System*** page (A) is opened.

1 Touch the ***Country*** tab (B).



Selecting the screen text language

Babylog VN500 is factory set to the customer's own language. The current language is displayed in the field (C).

Selecting a different language:

2 Touch the ▼ button (D).

Babylog VN500 opens the selection list containing the available languages.

3 Select the language with the rotary knob and push to confirm.

Setting the date and time

Babylog VN500 does not change over automatically between daylight saving time and standard time. The user must change the time manually. Otherwise the times will be incorrect on the screen and for saved values and actions (e.g., in the logbook).

Changing the system time changes the time displayed in trends, logbook, alarm history, maneuver measured values and reference loops. The data saved up to the change is displayed with the system time up till then.

1 Touch the appropriate button:
– Day (E)
– Month (F)
– Year (G)
– Hours (H)
– Minutes (I)

The order of the buttons (E) and (F) varies depending on language.

2 Set the value by turning the rotary knob and push to confirm.

3 After completing all the settings for the date and time, touch the ***Apply*** button (J) and confirm with the rotary knob.

Entering the height above sea level

The ambient pressure is considered in the calculation of measured values. The ambient pressure sensor is checked for plausibility using the entered height above sea level. Incorrect entries can mean that the ambient pressure sensor is recognized as incorrect.

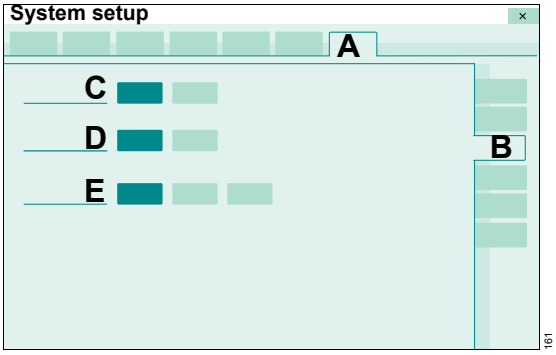
1 Touch the (K) button.

2 Set the height by turning the rotary knob and push to confirm.

Configuring units

Prerequisite: The ***System*** page (A) is opened.

1 Touch the ***Units*** tab (B).



The units for the following parameters can be selected.

– ***Airway pressure*** (C) in ***mbar*** or ***cmH2O***
– ***Height*** (D) in ***m, cm*** or ***feet, inch***
– ***CO2*** (E) in ***Vol%*** or ***mmHg*** or ***kPa***
The unit selected for the CO_2 measured value is adopted for selection of the alarm limit.

2 Touch the relevant button for the unit.

Configuring interfaces

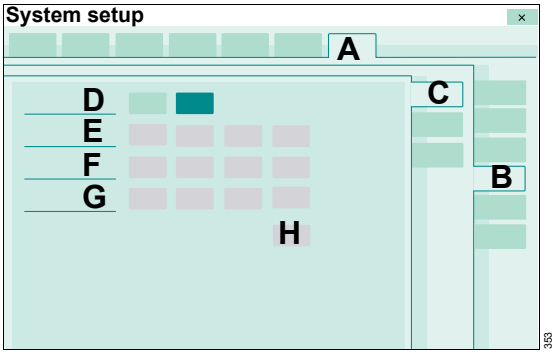
The communication settings can be configured to enable connection to a network and data exchange with other devices.

LAN

Use of LAN ports is exclusively permitted for service purposes. Parameters must be set for connection to a network.

Prerequisite: The ***System*** page (A) is opened.

1 Touch the ***Interface*** tab (B).



The ***LAN*** page (C) appears by default. The settings are displayed. ***DHCP*** (D) must be deactivated in order to change the settings.

To deactivate ***DHCP*** (D):

1 Touch the ***Off*** button.

2 Touch the relevant button for the network parameters:
– ***IP address*** (E)
– ***Subnet mask*** (F)
– ***Gateway*** (G)

3 Enter the login details using the rotary knob and confirm.

4 Touch the ***Apply*** button (H).

To activate ***DHCP*** (D):

5 Touch the ***On*** button.

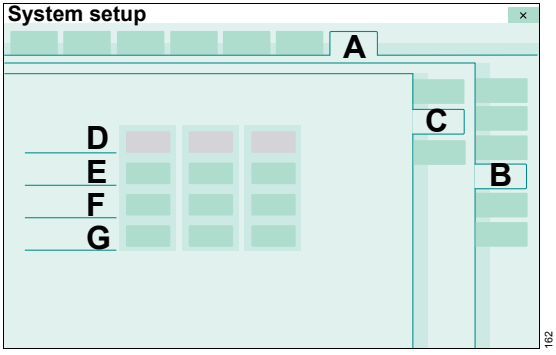
Serial interfaces

The data exchange takes place via the serial interfaces (COM 1, COM 2 and COM 3) with MEDIBUS-capable display devices, e.g., patient monitor or Patient Data Management System.

Prerequisite: The ***System*** page (A) is opened.

1 Touch the ***Interface*** tab (B).

2 Touch the ***COM*** tab (C).



The settings for ***COM 1***, ***COM 2***, and ***COM 3*** are displayed. ***MEDIBUS*** or ***MEDIBUS.X*** can be selected for the ***Protocol*** parameter.

3 Touch the relevant button for the interface parameters:
- ***Protocol*** (D)
- ***Baud rate*** (E)
- ***Parity*** (F)
- ***Stop bit*** (G)

4 Select the setting with the rotary knob and push to confirm.

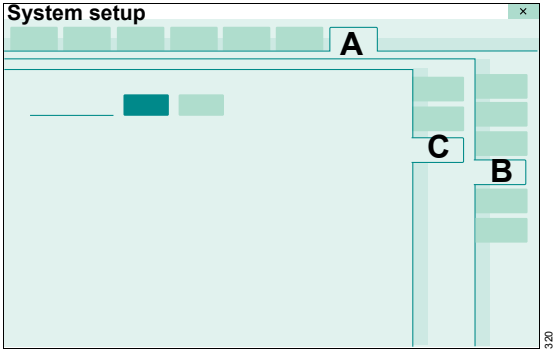
External screen

If a second screen is connected to Infinity C500, the user has to make a setting indicating whether the screen is analog or digital.

Prerequisite: The ***System*** page (A) is opened.

1 Touch the ***Interface*** tab (B).

2 Touch the ***External display*** tab (C).



3 Touch the ***Digital*** or ***Analog*** button.

Additional information

The serial interface connectors are located on the rear of Infinity C500.

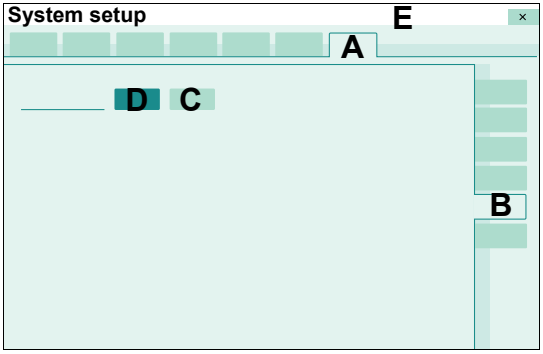
Configuring supply units

Functionality of the gas supply unit GS500

The functionality of the gas supply unit can be deactivated if Babylog VN500 is equipped with a gas supply unit that is currently not supposed to be used.

Prerequisite: The ***System*** page (A) is opened.

- Touch the ***Supply units*** tab (B).



- Touch the ***Off*** button (C).

The gas supply unit is no longer available. In the device check, the system does not display the test step ***Gas supply unit***.

Activating the functionality of the gas supply unit:

1 Touch the ***On*** button (D).

Babylog VN500 displays in the message field (E) that the device check has to be carried out.

2 Perform device check.

Additional information

Using the gas supply unit, see "Gas supply unit GS500" on page 98.

Service dialog

The service dialog is password-protected and reserved for DrägerService or service personnel.

The following Remote Service functions are available in the service dialog from software release 2.20:
– Help Ticket
– Remote Device Check

Contact the responsible DrägerService representative for further information on Remote Service.

This page intentionally left blank.

Alarm – Cause – Remedy

The alarm messages are displayed in the message field of the header bar in hierarchical order.

Different background colors indicate the priority levels of the alarms.

In the tables for ***Current alarms*** and ***Alarm history*** the priority of the alarm messages is also indicated by exclamation marks.

Warning	!!!	Red	High-priority alarm message	Immediate action is necessary in order to avert an acute danger
Caution	!!	Yellow	Medium-priority alarm message	Prompt action is necessary in order to avert a danger
Note	!	Cyan	Low-priority alarm message	Attention is necessary, but a delayed response is sufficient

In order to classify the alarms within an alarm category, internal priority numbers are given after the exclamation marks in the table below. The most critical alarm is awarded the number 255. The priority of the alarm decreases the lower the number is.

If several alarms occur at the same time, the two most critical alarms are displayed first in the alarm message field of the header bar.

In the following table, the alarm messages are listed in alphabetical order. If an alarm occurs, the table helps to identify causes and remedies. The different causes and remedies should be worked through in the order listed until the alarm has been resolved.

Alarm priority		Alarm message	Cause	Remedy
!!	050	"Audio paused" key used too often	The "Audio paused" key is either faulty or was pressed more than 80 times per hour.	The function of the "Audio paused" key is not available while the defect exists. If the defect cannot be remedied, call DrägerService.
!!	050	"Audio paused" overused or stuck	The "Audio paused" button is either stuck or faulty or was pressed for more than 6 seconds.	Ventilation functions are not affected. Do not press the "Audio paused" button longer than 6 seconds. If the error persists, call DrägerService.
!	060	Accessory ID detection failed	Accessory ID detection malfunction.	Ventilation can be started without ID functions. Call DrägerService.
!	100	Air supply low, GS500 active	Central air supply low. Air is supplied by gas supply unit GS500. Air supply is not required when FiO_2 = 100 Vol.%.	Check connection to Air supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Consider readjusting ventilation settings. Remove connection to Air supply if alarm condition persists (to avoid reverse flow into the Air supply).
			Central Air supply insufficient. Gas delivery system is supplied with Air delivered by GS500.	Check connection to central air supply and to gas supply unit GS500. Make sure that the supply pressure is greater than 3 bar (43.5 psi). Adjust ventilation settings, if necessary.

Alarm priority		Alarm message	Cause	Remedy
!!!	190	Airway obstructed?	The ventilation unit applies only a very small volume with each mechanical breath. The tube or mask could be blocked.	Check patient condition.
				Check tube or mask.
			Patient breathes against the mechanical breaths during pressure-controlled ventilation.	Check patient condition.
				Check ventilation settings.
!!!	205	Airway pressure high	Breathing hose kinked.	Check breathing circuit.
				Check tube or mask.
			The upper alarm limit for the airway pressure has been exceeded. The patient is breathing against the ventilation unit or coughing.	Check patient condition.
				Check ventilation settings.
				Adjust alarm limit if necessary.
!!!	200	Airway pressure low	Leakage or disconnection.	Check breathing circuit for tight connections.
				Check whether the expiratory valve is properly engaged.
				Make sure that the tube or mask is connected correctly.
!!!	140	Airway pressure negative	Airway pressure has fallen below –10 mbar (–10 cmH_2O).	Disconnect tube for suctioning.
				Check patient condition.
				Check ventilation settings.
			The breathing hose is connected to the expiratory valve during O_2 therapy.	Connect breathing hose to the inspiratory valve.
!!	140	Airway pressure negative (averaged)	Average airway pressure has fallen below –2 mbar (–2 cmH_2O).	Disconnect tube for suctioning.
				Check patient condition.
				Check ventilation settings.
!	120	Alarm system failure	Failure of primary alarm speaker. In case of an alarm situation, the auxiliary acoustical alarm will sound.	To continue ventilation with this device, continuously monitor the device functions. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!	100	Ambient pressure sensor?	Altitude setting deviates too much from measured ambient pressure.	Check altitude setting and adjust if necessary. If the setting has been adjusted, the device check must be repeated.
			Ambient pressure sensor failure.	Accuracy of measured values depending on the atmospheric pressure could be impaired (e.g., MV, O_2 concentration). Call DrägerService.
!!!	181	Apnea	The patient has stopped breathing.	Check patient condition. Apply controlled ventilation if necessary.
			Obstruction.	Check patient condition. Check breathing circuit. Check tube or mask.
			Flow sensor is not calibrated or faulty.	Calibrate flow sensor and replace it if necessary.
!!	230	Apnea Ventilation	Due to detected apnea, the ventilation unit has automatically switched to Apnea Ventilation.	Check patient condition. Check tube or mask. Check ventilation settings and patient condition. Return to the original ventilation mode by touching the "Apn. Vent. reset" button and confirm with rotary knob.
!	020	Application already installed	Application is already installed.	Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.

Alarm priority		Alarm message	Cause	Remedy
!	020	Application transfer failed	Invalid application.	Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob. Call DrägerService.
			Application installation failed.	Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob. Call DrägerService.
!!	120	Auxiliary acoustical alarm failure	Failure of auxiliary alarm speaker. In case of mains failure and discharged battery, there is no power failure alarm. In case of faulty primary alarm speaker, there is no acoustical alarm at all.	To continue ventilation with this device, continuously monitor the device functions. Downgrade alarm priority by touching "ALARM RESET" button and confirm with rotary knob. Call DrägerService.
!!!	160	Battery activated	The ventilation unit is powered by the battery as there is no mains power supply. – If PS500 is not connected, the maximum operating time is 30 minutes. – If PS500 is connected, the maximum operating time is 360 minutes.	Connect device to the mains power supply.
!!	200	Battery activated	The ventilation unit is powered by the battery as there is no mains power supply. – If PS500 is not connected, the maximum operating time is 30 minutes. – If PS500 is connected, the maximum operating time is 360 minutes.	Connect device to the mains power supply.

Alarm priority		Alarm message	Cause	Remedy
!!!	254	Battery discharged	The operating time of the battery has expired.	Connect device immediately to the mains power supply.
!!	120	Battery failure	In case of mains supply failure, battery operation is not available.	To continue ventilation with this device, continuously monitor the device functions. Call DrägerService.
!!!	250	Battery low	The remaining capacity is less than 10 %.	Connect device to the mains power supply.
!!	105	Breath. circ. does not fit to patient category	Connected breathing circuit does not fit to selected patient category.	Use suitable breathing circuit or select correct patient category.
!!	100	Breathing circuit does not match config.	Breathing circuit has been exchanged. The new breathing circuit does not match the one that was used before.	Check breathing circuit. Acknowledge message by pressing "ALARM RESET" and confirm.
!	060	Breathing circuit ID invalid	Accessory ID detection failed. No automatic adjustment of breathing circuit properties.	Replace ID Breathing Circuit or perform breathing circuit check. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
			Accessory ID detection failed. Breathing circuit exchange interval cannot be monitored.	Replace Infinity ID Breathing Circuit or acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!!	205	Breathing hose kinked	The pressure at the inspiratory port is greater than 30 mbar (30 cmH_2O), e.g., due to a kinked or blocked hose, or a blocked mask.	Check breathing circuit. Check mask.

Alarm priority		Alarm message	Cause	Remedy
!!	105	Breathing hoses interchanged	Inspiratory and expiratory limbs of the breathing circuit are connected reversely to the ventilation unit.	Connect inspiratory and expiratory limbs of the breathing circuit correctly.
!!!	240	Calibration of gas delivery system required	Technical malfunction detected during operation. Calibration of gas delivery system failed. Recalibration necessary. Ventilation not possible.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Perform device check.
!	012	Calibration of gas delivery system required	Technical malfunction detected in standby mode. Calibration of gas delivery system failed. Recalibration necessary.	Perform device check. Do not start with ventilation before device check is performed: Ventilation will not be possible.
			Technical malfunction detected in standby mode. Calibration of gas delivery system is due. Accuracy of gas delivery system could be impaired. Recalibration necessary.	Perform device check.
			Technical malfunction detected in standby mode. Calibration of gas delivery system failed.	Perform device check. Do not start with ventilation before device check is performed: Ventilation will not be possible. If alarm cannot be resolved by performing device check, call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!!	228	Calibration of neo. flow sensor required	Calibration data is corrupted.	Patient category "Neonates": Calibrate neonatal flow sensor. If calibration was not successful, deactivate neonatal flow monitoring and use external flow monitoring. Call DrägerService.
				Patient type "Pediatric patient": Calibrate neonatal flow sensor. If not successful: Deactivate integrated neonatal flow monitoring and use external flow monitoring. Call DrägerService.
!!	115	Calibration of neo. flow sensor required	After switching on the ventilation unit, the neonatal flow sensor needs to be calibrated.	Calibrate neonatal flow sensor.
!!!	228	Calibration of neonatal flow sensor failed	Calibration of neonatal flow sensor failed.	Calibrate neonatal flow sensor. Seal neonatal flow sensor properly during calibration.
			Neonatal flow sensor malfunction.	Replace neonatal flow sensor or sensor insert and calibrate the new sensor.
!!	118	Calibration of O_2 sensor required	O_2 measurement provides inaccurate values.	Calibrate O_2 sensor.

Alarm priority		Alarm message	Cause	Remedy
!!	100	Check CO_2 cuvette	The selected type of CO_2 cuvette is not correct.	Select the correct type of CO_2 cuvette.
			CO_2 cuvette or sensor soiled.	Clean the CO_2 cuvette or sensor.
			CO_2 sensor drift.	Perform zero calibration.
			Inspiratory CO_2 concentration high.	Check ventilation settings. Check patient condition.
!!	140	Check settings	Loss of stored data was detected.	Check all settings and adjust if necessary. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!!	252	Check ventilation settings	Due to data loss, the device uses previous settings.	Check all therapy settings and adjust them if necessary. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!!	252	Check ventilation settings	While adjusting ventilation settings or alarm limits, a power interruption occurred.	The device may apply default settings. Check ventilation settings and alarm limits. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
			Data loss.	The device may apply default settings. Check ventilation settings and alarm limits. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!!!	144	Clean CO_2 cuvette	Cuvette or sensor window is soiled, e.g. with deposits due to nebulization.	Use clean cuvette and/or clean CO_2 sensor.

Alarm priority		Alarm message	Cause	Remedy
!!!	145	CO_2 measurement failed	CO_2 sensor faulty.	Replace faulty CO_2 sensor.
			CO_2 measurement incorrect.	Use external CO_2 monitoring and deactivate integrated CO_2 monitoring. Call DrägerService.
!!!	146	CO_2 sensor?	Plug of CO_2 sensor was removed during operation.	Reinsert plug.
			CO_2 sensor not positioned on cuvette.	Place CO_2 sensor on cuvette.
			CO_2 sensor faulty.	Replace faulty CO_2 sensor.
!!!	142	CO_2 zero calibration?	Zero point of the CO_2 sensor is outside of the tolerance range.	Perform zero calibration.
			Cuvette or sensor window is soiled, e.g. with deposits due to nebulization.	Use clean cuvette and/or clean CO_2 sensor.
!	100	Cockpit restarted	Internal communication error caused restart of the cockpit.	Check all therapy settings and adjust them if necessary. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!!!	252	Data loss	Loss of stored data was detected.	To continue ventilation with this device, continuously monitor the device functions. Downgrade alarm priority by touching "ALARM RESET" button and confirm with rotary knob. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!	240	Device check failed	A safety-related failure was detected during device check.	Do not use this device for ventilation therapy. Call DrägerService.
				Check assembly and position of expiratory valve. Replace expiratory valve if required. Do not use this device for ventilation therapy unless the device check was repeated successfully.
!	100	Device check incomplete	Device check not completely performed or partially unsuccessful.	Perform device check. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!!!	253	Device failure	Due to missing measurements, ventilation is not possible anymore.	Immediately disconnect the patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!!	253	Device failure (1)	Internal safety system failure.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!!	253	Device failure (2)	Internal safety system failure.	Do not use this device for ventilation therapy. Call DrägerService.
!!!	253	Device failure (3)	Internal communication failure.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!!	253	Device failure (4)	Defective system data storage media detected.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Switch off the device. Call DrägerService.
!!!	253	Device failure (5)	Gas delivery system faulty.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!!	253	Device failure (6)	Gas delivery system faulty.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!!	253	Device failure (7)	Gas delivery system faulty.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!!	253	Device failure (8)	Test alarm which should only be triggered during maintenance.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!	100	Device failure (9)	No mass storage device found.	Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!!	200	Device temperature high	The internal device temperature is too high.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Switch off the device. Call DrägerService.
!!	141	Device temperature measurement failed	Failure of the internal breathing-gas temperature measurement. In case of a too high breathing-gas temperature, there is no alarm.	To continue ventilation with this device, use external breathing gas temperature monitoring. Call DrägerService.
!!	141	Device temperature measurement failed	Failure of the internal temperature measurement. No alarm in case of a too high device temperature.	To continue ventilation with this device, continuously monitor the device functions. Call DrägerService.
!!!	200	Disconnection?	Leakage or disconnection.	Check breathing circuit for tight connections. Check whether the expiratory valve is properly engaged. Make sure that the tube or mask is connected correctly.
!!!	138	etCO_2 high	Upper alarm limit for end-expiratory CO_2 concentration has been exceeded.	Check patient condition. Check ventilation settings. Adjust alarm limit if necessary. Perform CO_2 zero calibration if necessary. Check whether the cuvette windows are soiled.

Alarm priority		Alarm message	Cause	Remedy
!!!	138	$etCO_2$ low	Lower alarm limit for end-expiratory CO_2 concentration has been exceeded.	Check patient condition. Check ventilation settings. Adjust alarm limit if necessary. Perform CO_2 zero calibration if necessary. Check whether the cuvette windows are soiled.
!!!	220	Expiratory valve faulty	Expiratory valve is not properly connected to the socket.	Insert expiratory valve correctly.
			Expiratory valve faulty.	Replace expiratory valve.
!!	100	Expiratory valve incompatible	Incompatible expiratory valve connected to the socket.	Replace expiratory valve.
!!!	130	FiO_2 high	O_2 sensor is not calibrated.	Calibrate O_2 sensor.
			Mixer function faulty.	Call DrägerService.
!!!	130	FiO_2 low	O_2 sensor is not calibrated.	Calibrate O_2 sensor.
			Mixer function faulty.	Call DrägerService.
!!	100	Flow measurement inaccurate	Flow sensor is not calibrated or faulty.	Calibrate flow sensor and replace it if necessary.
			Water in flow sensor.	Drain water trap of breathing circuit. Dry flow sensor.
			Flow measurement is not reliable. Expiratory minute volume exceeds minute volume delivered by the ventilation unit.	To continue ventilation with this device, use external flow monitoring and deactivate integrated flow monitoring. This could impair the quality of ventilation. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!!	110	GS500 communication failure	Communication to gas supply unit GS500 lost.	Check communication connection to gas supply unit GS500. Acknowledge message by pressing "ALARM RESET" and confirm. Call DrägerService.
!	110	GS500 communication failure	Communication to gas supply unit GS500 lost.	Check communication connection to gas supply unit GS500. Acknowledge message by pressing "ALARM RESET" and confirm. Call DrägerService.
!!!	100	GS500 failure	Air supply insufficient to deliver required flow and pressure. Gas delivery system supplied with O_2 only. Ventilation continues with O_2 only.	Check connection to gas supply unit GS500. If this condition persists, call DrägerService.
!!!	110	GS500 internal failure	Gas supply unit GS500 has reported a failure.	GS500 with mains plug: Restart gas supply unit GS500. GS500 without mains plug: Shut down ventilation unit. Switch toggle switch to "Off" to disconnect ventilation unit from power supply. Switch toggle switch to "On" and restart ventilation unit. If this condition persists, call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!	110	GS500 internal failure	Gas supply unit GS500 has reported a failure.	GS500 with mains plug: Restart gas supply unit GS500. GS500 without mains plug: Shut down ventilation unit. Switch toggle switch to "Off" to disconnect ventilation unit from power supply. Switch toggle switch to "On" and restart ventilation unit. If this condition persists, call DrägerService.
!!!	110	GS500 temperature too high	Gas supply unit GS500 temperature is too high.	GS500 with mains plug: Switch off gas supply unit GS500. GS500 without mains plug: Shut down ventilation unit. Switch toggle switch to "Off". Call DrägerService.
!	060	ID tag of expiratory valve faulty	Accessory ID detection failed. Expiratory valve exchange interval cannot be monitored.	Replace Infinity ID Expiratory Valve or acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!	020	Import failed, check settings	Configuration import failed.	Check all settings and adjust if necessary. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!	020	Import successful, check settings	Configuration import was successful.	Check all settings and adjust if necessary. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.

Alarm priority		Alarm message	Cause	Remedy
!	150	Inspiratory hold interrupted	The "Man. insp./hold" button was pressed too long.	Release "Man. insp./hold" button.
!!	120	Internal power supply failure	Technical failure detected.	To continue ventilation with this device, continuously monitor the device functions. Call DrägerService.
!	140	Leakage	Only monitored for intubated patients!	Check for leakages in breathing circuit.
			The measured relative leakage exceeds 55 %.	Make sure that the tube is connected correctly.
!	008	MEDIBUS communication failed	MEDIBUS communication failure.	Ventilation functions are not affected. Check MEDIBUS connection. Check MEDIBUS settings.
!!!	160	MV high	The minute volume exceeds the upper alarm limit.	Check patient condition.
				Check ventilation settings.
				Adjust alarm limit if necessary.
			Water in flow sensor.	Drain water trap of breathing circuit. Dry flow sensor.
			Flow sensor is not calibrated or faulty.	Calibrate flow sensor and replace it if necessary.

Alarm priority		Alarm message	Cause	Remedy
!!!	160	MV low	The minute volume has fallen below the lower alarm limit.	Check patient condition.
				Check ventilation settings.
				Adjust alarm limit if necessary.
			Obstruction.	Check patient condition.
				Check breathing circuit.
				Check tube or mask.
			Flow sensor is not calibrated or faulty.	Calibrate flow sensor and replace it if necessary.
			Leakage or disconnection.	Check breathing circuit for tight connections.
				Check whether the expiratory valve is properly engaged.
				Make sure that the tube or mask is connected correctly.
			Device failure.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator.
				Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!	110	Nebulization canceled	Air and O_2 supply insufficient to deliver required flow and pressure for nebulization. Nebulization canceled.	Check connections to Air and O_2 supply. Make sure supply pressures are greater than 3 bar (43.5 psi). Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
			Inspiratory flow insufficient for nebulization.	Increase inspiratory flow to more than 6 L/min for neonates and pediatric patients. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
			Air supply insufficient to deliver required flow and pressure for nebulization.	Check connection to Air supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
			O_2 supply insufficient to deliver required flow and pressure for nebulization.	Check connection to O_2 supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.

Alarm priority		Alarm message	Cause	Remedy
			Internal supply pressures too high. Air and O_2 supply insufficient to deliver required flow and pressure for nebulization.	Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob. Call DrägerService.
			Neonatal flow monitoring active. Nebulization is only possible if neonatal flow monitoring is deactivated and neonatal flow sensor is removed from breathing circuit.	Deactivate neonatal flow monitoring and remove neonatal flow sensor. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
			Incompatible ventilation mode. Nebulization is only possible in pressure-controlled ventilation modes without Volume Guarantee.	Select an appropriate ventilation mode. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!	100	Nebulization finished	Nebulization finished or canceled.	Install neonatal flow sensor. Switch on neonatal flow monitoring. Acknowledge message by pressing "ALARM RESET" and confirm.
!!	100	Nebulizer uses Air only	O_2 supply insufficient to deliver required flow and pressure for nebulization. Nebulizer is supplied with Air only. Increased deviation from the set FiO_2.	Check connection to O_2 supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Downgrade alarm priority by touching "ALARM RESET" button and confirm with rotary knob.

Alarm priority		Alarm message	Cause	Remedy
!!	100	Nebulizer uses O_2 only	Air supply insufficient to deliver required flow and pressure for nebulization. Nebulizer is supplied with O_2 only. Increased deviation from the set FiO_2.	Check connection to Air supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Downgrade alarm priority by touching "ALARM RESET" button and confirm with rotary knob.
!!!	228	Neonatal flow measurement failed	Neonatal flow measurement malfunction.	In case of modes with tidal volume or trigger setting: Check ventilation settings. Change ventilation mode if required. Use external flow monitoring and deactivate the integrated flow monitoring. Call DrägerService.
				In case of modes without tidal volume or trigger setting: Ventilation functions are not affected. To continue ventilation with this device, use external flow monitoring and deactivate the integrated neonatal flow monitoring. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!!	228	Neonatal flow sensor failure	Neonatal flow sensor cable faulty.	Replace neonatal flow sensor cable.
			Neonatal flow sensor faulty.	Replace neonatal flow sensor or sensor insert and calibrate the new sensor.
			Neonatal flow measurement malfunction.	In case of modes with tidal volume or trigger setting: Check ventilation settings. Change ventilation mode if required. Use external flow monitoring and deactivate the integrated flow monitoring. Call DrägerService.
				In case of modes without tidal volume or trigger setting: Ventilation functions are not affected. To continue ventilation with this device, use external flow monitoring and deactivate the integrated neonatal flow monitoring. Call DrägerService.
!	100	Neonatal flow sensor replaced?	Reconnection of the neonatal flow sensor detected.	Confirm message if calibrated neonatal flow sensor is still used. Otherwise calibrate neonatal flow sensor.
			Neonatal flow monitoring was temporarily deactivated.	Confirm message if calibrated neonatal flow sensor is still used. Otherwise calibrate neonatal flow sensor.
!!	115	Neonatal flow sensor soiled	Water or secretion in the neonatal flow sensor.	Replace neonatal flow sensor or sensor insert and calibrate the new sensor.

Alarm priority		Alarm message	Cause	Remedy
!!!	229	Neonatal flow sensor?	Neonatal flow sensor is not connected.	Check connections of the neonatal flow sensor and cable.
			Neonatal flow sensor malfunction.	Replace neonatal flow sensor or sensor insert and calibrate the new sensor.
!!!	250	No Air supply	Air supply insufficient to deliver required flow and pressure. Gas delivery system supplied with O_2 only. Ventilation continues with O_2 only.	Check connection to Air supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Consider readjusting ventilation settings. Remove connection to Air supply if alarm condition persists (to avoid reverse flow into the Air supply).
!	100	No Air supply	Air supply insufficient. If FiO_2 = 100 Vol%, Air supply is not required.	Check connection to Air supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Consider readjusting ventilation settings. Remove connection to Air supply if alarm condition persists (to avoid reverse flow into the Air supply).
!!!	250	No O_2 supply	O_2 supply insufficient to deliver required flow and pressure. Gas delivery system supplied with Air only. Ventilation continues with Air only.	Check connection to O_2 supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Consider readjusting ventilation settings. Remove connection to O_2 supply if alarm condition persists (to avoid reverse flow into the O_2 supply).

Alarm priority		Alarm message	Cause	Remedy
!	100	No O_2 supply	O_2 supply insufficient. If FiO_2 = 21 Vol%, O_2 supply is not required.	Check connection to O_2 supply. Make sure supply pressure is greater than 3 bar (43.5 psi). Consider readjusting ventilation settings. Remove connection to O_2 supply if alarm condition persists (to avoid reverse flow into the O_2 supply).
!!	119	Nurse call failure	Technical failure detected.	To continue ventilation with this device, continuously monitor the device functions. Call DrägerService.
!!	110	O_2 and Air supply pressures differ too much	The difference between O_2 supply pressure and Air supply pressure can lead to an incorrect O_2 concentration during nebulization.	Check connections to Air and O_2 supply. Make sure supply pressures are greater than 3 bar (43.5 psi). Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!!!	132	O_2 measurement failed	O_2 measurement provides invalid values.	Calibrate O_2 sensor. To continue ventilation with this device, use external O_2 monitoring and deactivate integrated O_2 monitoring. Call DrägerService.
!!	040	Oxygenation maneuver failed	Internal error during oxygenation maneuver.	Do not perform suction maneuver until the device was checked. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!!	140	PEEP high	Expiratory valve or breathing circuit obstructed.	Check breathing circuit and expiratory valve. Check for condensate.
			Expiratory resistance increased.	Check viral/bacterial filter. Replace it if necessary.
			Device failure.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!!	140	PEEP low	Measured PEEP is 5 mbar (5 cmH_2O) less than set PEEP.	Check breathing circuit for tight connections.
				Check whether the expiratory valve is properly engaged.
				Make sure that the tube or mask is connected correctly.
!!	210	Perform device and breathing circuit check	Device check and breathing circuit check must be performed before operation.	Perform device check. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.
!!!	140	Plow high	Expiratory valve or breathing circuit obstructed.	Check breathing circuit and expiratory valve. Check for condensate.
			Expiratory resistance increased.	Check viral/bacterial filter. Replace it if necessary.
			Device failure.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
			Not monitored if AutoRelease is enabled. Not monitored if Tlow is set to less than 1 second.	To enable monitoring switch off AutoRelease or increase Tlow to >1 second.

Alarm priority		Alarm message	Cause	Remedy
!!!	140	Plow low	Measured Plow is 5 mbar (5 cmH_2O) less than set Plow.	Check breathing circuit for tight connections.
				Check whether the expiratory valve is properly engaged.
				Make sure that the tube or mask is connected correctly.
!!!	238	Pressure measurement failed	Pressure measurement malfunction.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!	140	Pressure measurement impaired	Pressure measurement malfunction.	Accuracy of measured values based on pressure could be impaired. To continue ventilation with this device, continuously monitor the device functions. Call DrägerService.
!!	100	Pressure measurement inaccurate	Fluid in expiratory valve.	Replace expiratory valve. Clean and dry used one.
			Breathing circuit check has not been performed.	Perform or repeat breathing circuit check.
			The inspiratory or expiratory hose is obstructed.	Check breathing circuit.
			Pressure measurement failure.	Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!!	140	Pressure sensor? Ventilation impaired	Ventilation patterns for which a pressure sensor is necessary cannot be performed. The ventilation unit applies back-up ventilation.	To continue ventilation with this device, use external pressure monitoring. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!	100	Product test: Not for clinical use	License for product test is installed.	Uninstall license for product test.
!!!	150	Respiratory rate high	The patient is breathing at a high respiratory rate.	Check patient condition.
				Check ventilation settings or spontaneous respiratory rate.
				Adjust alarm limit if necessary.
			The set respiratory rate exceeds upper alarm limit.	Adjust the respiratory rate or the upper alarm limit for the respiratory rate.
			Auto triggering caused by water in the breathing circuit.	Drain water trap of breathing circuit. Dry flow sensor.
				Check breathing circuit.
!	100	Restart of ventilation unit delayed	Technical failure detected. Last restart was delayed.	Downgrade alarm priority by touching "ALARM RESET" button and confirm with rotary knob. To continue ventilation with this device, continuously monitor the device functions. Call DrägerService.
!!	050	Rotary knob stuck or pressed too long	The rotary knob is either faulty or was pressed for more than 20 seconds without turning.	If you are still pressing the rotary knob, release it. Otherwise press and turn rotary knob repeatedly. If alarm condition persists, settings cannot be adjusted anymore. Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.

Alarm priority		Alarm message	Cause	Remedy
!!	050	Rotary knob used too often	The rotary knob is either faulty or was pressed more than 5 times per second.	Press and turn rotary knob repeatedly. If alarm condition persists, settings cannot be adjusted anymore. Disconnect patient from the device and continue ventilation without delay using another independent ventilator. Call DrägerService.
!	100	Service date almost reached	Service date is almost reached.	Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob. Call DrägerService.
!	100	Service date reached	Service is due.	Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob. Call DrägerService.
!!!	255	Standby mode activated	Device has been switched to standby mode.	Acknowledge standby mode by touching "ALARM RESET" button and confirm with rotary knob.
!!	040	Suction maneuver failed	Internal error during suction maneuver.	Do not perform suction maneuver until the device was checked. Call DrägerService.
!	140	Suction maneuver overused?	The suction maneuver has been performed more than 5 times within an hour.	Perform suction maneuver less frequently.
!!	255	Ventilation unit restarted	Internal communication error caused restart of the ventilation unit.	Check all therapy settings and adjust them if necessary. Acknowledge message by touching "ALARM RESET" button and confirm with rotary knob.

Alarm priority		Alarm message	Cause	Remedy
!	190	VT limited	The delivered tidal volume exceeds the set maximum tidal volume.	Check patient condition.
				Check ventilation settings.
!!	166	VT low	For more than eight breaths, the applied VT has been less than 90% of the set VT.	Check ventilation settings.
				Check patient condition.
			The pressure of a breath is limited by the set "Paw high" limit or Pmax. The set tidal volume could not be delivered.	Adjust "Paw high" alarm limit or Pmax.
!	140	VT not reached, leakage	Set volume cannot be reached. Flow delivery terminated.	Check for leakages in breathing circuit.
				Make sure that the tube or mask is connected correctly.
!	100	Wrong or invalid applications found	Wrong or defective application card.	Call DrägerService.

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Cleaning, disinfection and sterilization

Safety information on reprocessing

CAUTION
To reduce the risk of infection to both hospital staff and patients, the device must be cleaned and disinfected whenever it has been used. Protective clothing, eye protection etc. must be worn.

- Observe the hospital hygiene regulations!
- Reprocess the device after every patient.

The reprocessing recommendations do not exempt staff from the obligation to adhere to the hygiene requirements and directives on occupational health and safety relating to the reprocessing of medical devices.

To ensure the professional reprocessing of medical devices, the recommendations provided by the Robert Koch Institute in "Demands on Hygiene in Reconditioning Medical Products" must be followed.

Dismantling

This chapter describes how to disconnect the ventilation accessories and dismantle them for reprocessing.

Observe before dismantling

1 Switch off the device and breathing gas humidifier and remove their power plugs.

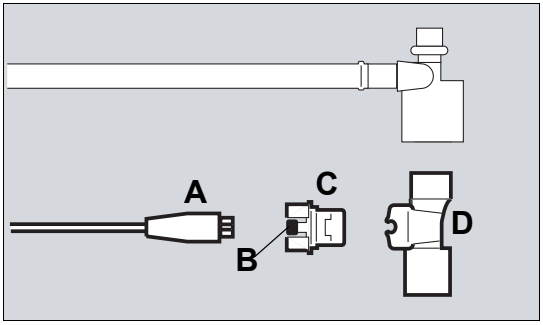
2 Drain the water traps and breathing hoses. Observe the hospital hygiene regulations!

3 Drain the water container of the breathing gas humidifier.

Dismantling the neonatal flow sensor

- Unplug sensor connector at the rear of the device.

Dismantling neonatal flow sensor ISO 15 (8411130)

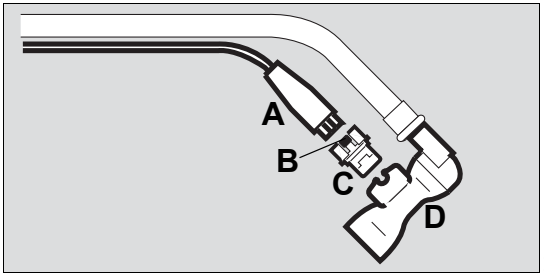


1 Disconnect plug (A) of the flow sensor cable from the neonatal flow sensor.

2 Gently press the knobs (B) on both sides while pulling the insert (C) out of the flow sensor housing.

3 Pull the flow sensor housing (D) out of the Y-piece.

Dismantling neonatal flow sensor Y-piece (8410185)



1 Disconnect plug (A) of the flow sensor cable from the neonatal flow sensor.

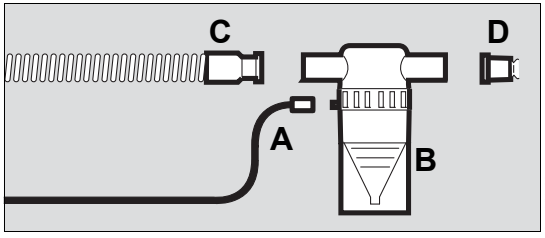
2 Press the knobs (B) on both sides while pulling the insert (C) out of the Y-piece.

3 Pull the Y-piece (D) out of the breathing hoses.

Reprocessing the neonatal flow sensor

- Observe related instructions for use.
- Reprocess the insert of the neonatal flow sensor immediately after every use.
- Reprocess the flow sensor housing or Y-piece of the neonatal flow sensor in accordance with the reprocessing list, see page 204.

Dismantling the pneumatic medication nebulizer



1 Remove the nebulizer hose (A) from the medication nebulizer (B) and from the nebulizer port on the device.

2 Remove the medication nebulizer (B) from the breathing circuit.

3 Remove the corrugated hose for the breathing circuit (C) from the inlet port.

4 Remove the corrugated hose (D) from the outlet port.

5 Dismantle the medication nebulizer in accordance with the corresponding Instructions for Use.

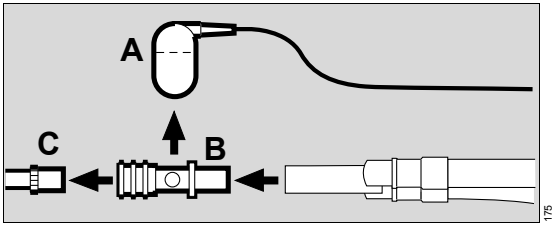
Reprocessing the medication nebulizer and parts for adapting

- Reprocess the individual parts of the medication nebulizer in accordance with the corresponding Instructions for Use.
- Reprocess the parts for adapting in accordance with the reprocessing list, see page 204.

CO_2 sensor

Dismantling the CO_2 sensor

1 Remove the CO_2 sensor plug from the socket.



2 Remove the CO_2 sensor (A) from the cuvette.

3 Remove the cuvette (B) of the CO_2 sensor from the Y-piece.

4 Remove the catheter cone (C) from the cuvette.

Reprocessing the CO_2 sensor and test filter

1 Wipe off any dirt, particularly on the windows, using a soft disposable tissue and cotton swabs.

2 Reprocess the CO_2 sensor and test filter in accordance with the reprocessing list, see page 204.

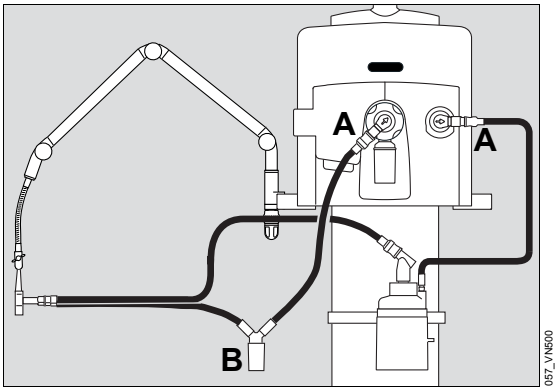
Reprocessing reusable cuvettes

Only reusable cuvettes (6870280) can be reprocessed. Disposable cuvettes are not temperature-resistant and may be destroyed. Dispose of disposable cuvettes.

1 Wipe off any dirt, particularly inside and outside the windows, using a soft disposable tissue and cotton swabs, under running water if necessary.

2 Reprocess the reusable cuvette in accordance with the reprocessing list, see page 204.

Disconnecting the breathing circuit



1 Pull the breathing hoses from the inspiratory port and the expiratory port (A).

NOTE

When removing the breathing hoses, always hold them at the connection sleeve and not at the spiral ribbing! Otherwise, the breathing hose may be damaged.

2 If fitted: Remove the water trap (B) from the breathing hose.

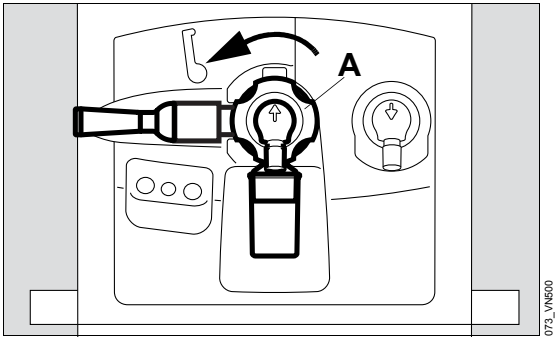
3 Remove the collection container from the water trap. Empty the collection container. Observe the hospital hygiene regulations!

Reprocessing the breathing circuit

- Reprocess the breathing hoses, water trap and collection container and also the Y-piece in accordance with the reprocessing list, see page 204.

Dismantling the expiratory valve

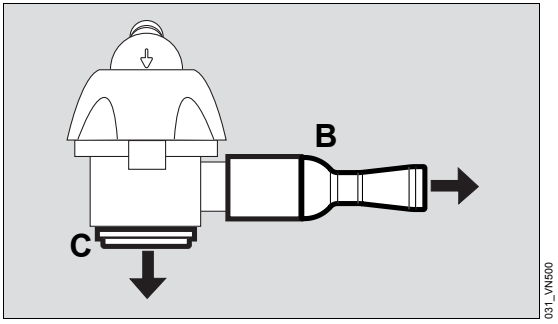
Removing the expiratory valve



1 Turn the locking ring (A) as far as possible to the left.

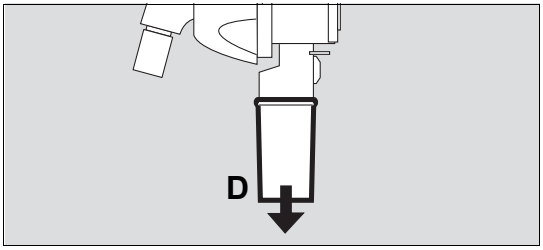
2 Remove the expiratory valve from the fitting.

Dismantling the expiratory valve



1 Remove the muffler (B) from the expiratory valve.

2 Remove the diaphragm (C). Do not dismantle the diaphragm any further.



3 Remove the collection container (D) from the water trap. Empty the collection container. Observe the hospital hygiene regulations!

Reprocessing the expiratory valve

- Reprocess the expiratory valve, diaphragm, muffler and collection container removed from the water trap in accordance with the reprocessing list, see page 204.

After cleaning and disinfection

- To ensure that all remaining liquid is dried completely in the interior areas, always carry out hot steam sterilization of the expiratory valve at 134 °C (273.2 °F) after cleaning and disinfection.

The expiratory valve can be reused as long as the test point in the device check is passed. Exchange the expiratory valve if signs of wear become visible, such as cracks in the plastic parts, deformation and hardening of the rubber parts. Discolorations of the metal insert do not impair its function.

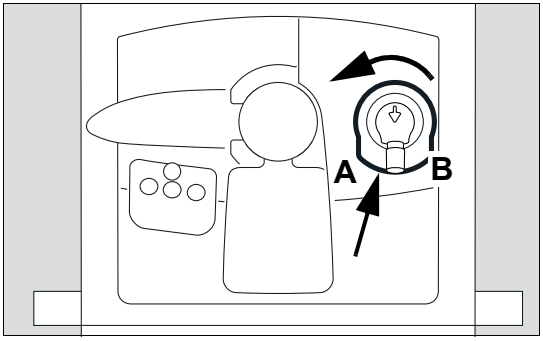
Dismantling the inspiratory unit

When the inspiratory unit must be reprocessed:

The inspiratory unit must only be reprocessed when patient gas has passed through the safety valve. In the case of spontaneously breathing patients, this can occur in the following situations:
– Excess pressure in the system caused by a kink in the expiratory hose
– Failure of both supply gases
– Complete failure of the electrical supply (failure of mains power supply and discharged or defective batteries)

Removing the inspiratory unit

The inspiratory unit must only be removed when the device is switched off.

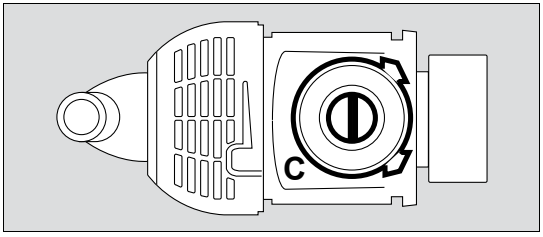


1 Press and hold the locking lever (A) on the underside of the inspiratory unit.

2 Simultaneously turn the inspiratory unit (B) approximately 20° counterclockwise.

3 Remove the inspiratory unit from the fitting.

Dismantling the inspiratory unit



1 Remove the diaphragm with adapter (C) from the fitting of the inspiratory unit.

2 Do not dismantle the inspiratory unit any further.

Reprocessing the inspiratory unit

- Reprocess the inspiratory unit and diaphragm in accordance with the reprocessing list, see page 204.

After cleaning and disinfection

- To ensure that all remaining liquid is dried completely in the interior areas, always carry out hot steam sterilization of the inspiratory unit at 134 °C (273.2 °F) after cleaning and disinfection.

Dismantling and reprocessing accessories

- Dismantle and reprocess the breathing gas humidifier, the Aeroneb Pro nebulizer and the bacterial filter in accordance with the corresponding Instructions for Use.

Reprocessing methods

Classification of medical devices

For reprocessing, the medical devices are classified according to their type of application and the resulting risk:
– Non-cricital medical devices: surfaces accessible to the user and the patient, e.g., device surfaces, cables
– Semi-critical medical devices: parts conveying breathing gas, e.g. breathing hoses, masks

Refering to its reprocessing, this medical device belongs to the group of non-cricital medical devices.

Testing of methods and agents

The cleaning and disinfection of the medical devices were tested using the following methods and agents. At the time of testing, the following agents showed good material compatibility and effectiveness:

Non-critical medical devices

Manual cleaning and disinfection:

– Buraton 10F from Schülke & Mayr

Semi-critical medical devices

Manual cleaning:

– Neodisher LM2 from Dr. Weigert

– Sekusept powder classic from ECOLAB (Infinity ID neonatal expiratory valve, neonatal flow sensor)

Manual disinfection:

– Korsolex extra from Bode Chemie

Machine cleaning:

– Neodisher MediClean from Dr. Weigert

Machine disinfection:

– Thermal, 93 °C (199.4 °F) for 10 minutes

Non-critical medical devices

Manual cleaning and disinfection

Manual disinfection should preferrably be performed with disinfectants based on aldehydes or quaternary ammonia compounds.

Observe the applicable country-specific listings for disinfectants. The list of the German Association for Applied Hygiene (Verbund für Angewandte Hygiene VAH) applies in German-speaking countries.

The composition of the disinfectant is the responsibility of the manufacturer and can change over time.

Strictly observe the manufacturer’s information on the disinfectant.

Carry out manual cleaning and disinfection

- Remove soiling immediately with a cloth soaked with disinfectant.

WARNING

Penetrating liquid may cause malfunction of or damage to the device, which may endanger the patient. Only wipe-disinfect the device surface and cables, making sure that no liquids penetrate into the device.

1 Carry out surface disinfection (scouring and wiping disinfection).

2 Remove disinfectant residues after the contact time has elapsed.

Semi-critical medical devices

Manual cleaning

Manual cleaning should preferrably be performed under running water or with commercially available cleaning agents based on mild alkaline compounds.

Carry out manual cleaning

1. Wash off visible soilings under running water. Using an ultrasound cleaner improves cleaning results, provided that the medical device is suitable for this procedure.
2. Use cleaning agents in accordance with manufacturer's specifications. Make sure that all surfaces and interior spaces to be cleaned can be efficiently reached. If necessary, use suitable brushes.
3. Rinse items under running water until cleaning agent residue is no longer discernible.
4. Inspect items for visible soiling and damage. If necessary, repeat manual cleaning.

Manual disinfection

Manual disinfection should preferrably be performed with disinfectants based on aldehydes or quaternary ammonia compounds.

Observe the applicable country-specific listings for disinfectants. The list of the German Association for Applied Hygiene (Verbund für Angewandte Hygiene VAH) applies in German-speaking countries.

The composition of the disinfectant is the responsibility of the manufacturer and can change over time.

Strictly observe the manufacturer's information on the disinfectant.

Carry out manual disinfection

1. Disinfect items by immersing.
2. After contact time, rinse items under running water until disinfectant residue is no longer discernible.
3. Inspect items for visible soiling and damage. If necessary, repeat manual disinfection.
4. Shake off all excess water. Allow items to dry thoroughly.

Machine cleaning and disinfection

Use a washer-disinfector in accordance with EN ISO 15883, preferably with a cart for anesthesia and ventilation accessories, for automatic cleaning and disinfection of breathing-gas conducting parts.

Carry out machine cleaning and disinfection

1. Strictly observe Instructions for Use of washer-disinfector.
2. Position items so that all interior spaces are completely flushed and water can drain off freely.
3. Use suitable cleaning agent.
4. Select suitable program (preferably anesthesia program).
   – Cleaning must be performed at 40 °C to 60 °C (104 °F to 140 °F) for at least 5 minutes.
   – Thermal disinfection must be performed at 80 °C to 95 °C (176 °F to 203 °F) and with corresponding contact time.
5. Carry out final rinsing with deionized water.
6. Immediately remove items from the washer-disinfector.
7. Inspect items for visible soiling and damage. If necessary, repeat program or carry out manual cleaning and disinfection.
8. Allow items to dry thoroughly.

Visual inspection

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

Sterilization

During sterilization, living microorganisms are removed from semi-critical medical devices. Residual water in the interior spaces of the components is also dried out.

- Only sterilize cleaned and disinfected items.

Use a vacuum steam sterilizer (in accordance with DIN EN 285), preferably with fractional vacuum.

CAUTION

Do not sterilize parts in ethylene oxide! Ethylene oxide may diffuse into the parts and cause damage to health.

- Hot steam sterilization can be performed at 134 °C (273.2 °F). Observe instructions for use of device.
- To ensure the effectiveness of sterilization, a minimum sterilization time of 5 minutes is required.

Sterilization of the expiratory valve or inspiratory valve may gradually impair the operation of RFID transmission. This may mean that Infinity ID breathing circuit functions may not work or may no longer work reliably. If the message ***Infinity ID breathing circuit detected.*** is not displayed when connecting an Infinity ID breathing circuit, then use a different Infinity ID breathing circuit. If the message is still not displayed, replace the expiratory valve or inspiratory valve.

Reprocessing List

Applicable to non-infectious patients.

CAUTION
For infectious patients, all parts that come into contact with breathing gas also have to be sterilized after disinfection and cleaning.

The list contains approximate values only. The instructions of the hospital's infection control officer shall prevail and must be observed by the user!

Non-critical medical devices

Components which can be reprocessed	Recommended reprocessing intervals	Manual	
		Cleaning	Disinfection
Ventilation Unit Babylog VN500	Per patient	Outside	Outside
Gas supply unit GS500	Per patient	Outside	Outside
Power supply unit PS500	Per patient	Outside	Outside
Trolley	Per patient	Outside	Outside
Hinged arm[1)]	Per patient	Outside	Outside
Universal holder	Per patient	Outside	Outside
Humidifier holder	Per patient	Outside	Outside
System cable	Per patient	Outside	Outside
Compressed gas hoses	Per patient	Outside	Outside

1) Observe the Instructions for Use for "Infinity Acute Care System hinged arm".

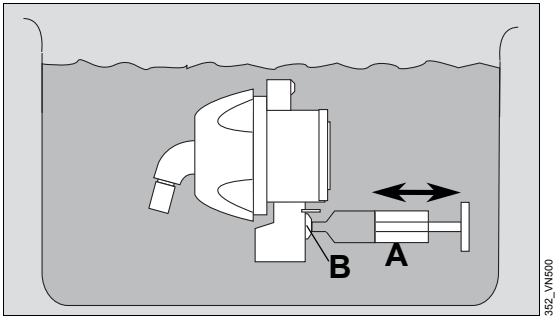
Semi-critical medical devices

Components which can be reprocessed	Recommended reprocessing intervals	Precleaning	Machine cleaning and disinfection	Manual		Sterilization
				Cleaning	Disinfection	
Breathing hoses	Per patient/weekly	Yes	Yes	Possible	Possible	Yes
Y-piece						
Water traps[1)]						
Collection container						
Infinity ID neonatal expiratory valve	Per patient/weekly[2)]	Yes	Yes	Possible[3)]	Possible[3)]	Yes
Diaphragm		Yes	Yes	Possible	Possible	Yes
Muffler						
Collection container of the water trap						
Inspiratory unit	If soiled[4)]	Yes	Yes	Possible	Possible	Yes
Diaphragm						
CO_2 sensor	Per patient	No	No	Outside	Outside[5)]	No
Reusable cuvette of the CO_2 sensor	Per patient / if soiled	Yes	Yes[6)]	Yes	Yes	Yes
Test filter for CO_2 sensor	If soiled	No	No	Yes	Yes[7)]	No
Flow sensor housing for the neonatal flow sensor ISO 15	Daily	Yes	Yes	Possible	Possible	Yes
Neonatal flow sensor Y-piece	Daily	According to the corresponding Instructions for Use[8)]				
Insert of the neonatal flow sensor	Daily	According to the corresponding Instructions for Use[9)]				
Breathing gas humidifier	Per patient/weekly	According to the corresponding Instructions for Use				
Medication nebulizer[1)]	According to the corresponding Instructions for Use					
Parts for adapting	Per patient/weekly	Yes	Yes	Possible	Possible	Yes
Bacterial filter	According to the corresponding Instructions for Use					

1) Keep spring-loaded valves (water trap, pneumatic medication nebulizer) open during reprocessing.
2) Nebulization may lead to increased deposits making it necessary to exchange the parts more often.
3) For additional information, see "Reprocessing the Infinity ID neonatal expiratory valve manually" on page 206.

4) The inspiratory unit must only be reprocessed when patient gas has passed through the safety valve. For additional information, see "Dismantling the inspiratory unit" on page 199.
5) Wipe disinfection, e.g., with 70 % ethanol. Do not disinfect CO_2 sensor by immersing.
6) Only cleaning agent, and no rinse aid, must be used for automatic cleaning of the cuvette. Otherwise, there is a risk of cracks developing.
7) Wipe disinfection, e.g., with 70 % ethanol. Avoid residues on the test filter.
8) For additional information, see "Reprocessing the neonatal flow sensor Y-piece manually" on page 206.
9) Do not use brushes on the insert of the neonatal flow sensor.

Reprocessing the Infinity ID neonatal expiratory valve manually



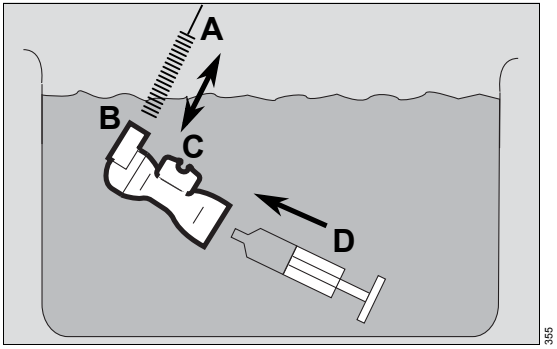
Carry out manual cleaning:

1 Immerse the neonatal expiratory valve in the solution and agitate it slightly so that the air can escape.

2 Before the contact time begins and after it has elapsed, fit a syringe (A) containing 20 mL of solution to the ejector channel (B). Inject and extract the solution several times with the syringe.

Perform manual disinfection in the same manner.

Reprocessing the neonatal flow sensor Y-piece manually



Carry out manual cleaning:

1 Immerse the Y-piece in the solution and agitate it slightly so that the air can escape.

2 Before the contact time begins and after the contact time has elapsed:

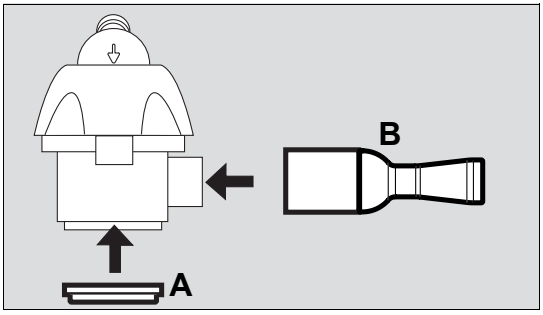
- Insert and remove a pipe cleaner (A) ten times into each of the two connection openings of the Y-piece (B) and then, at an angle, insert and remove the pipe cleaner ten times in the openings at both sides of the aperture for the insert (C).
- Fit a syringe (D) containing 20 mL of the solution to each opening of the Y-piece. Inject the solution three times.

Perform manual disinfection in the same manner.

Assembling parts

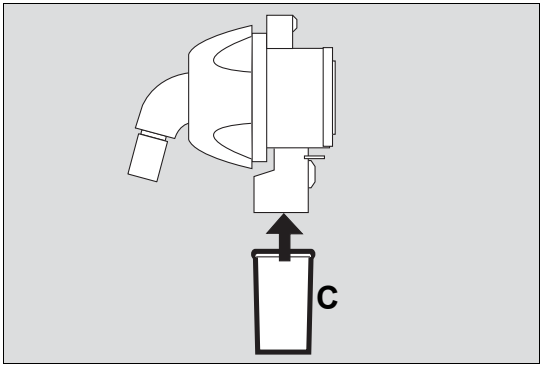
Assembling expiratory valve

1 Make sure all parts of the expiratory valve are completely dry, otherwise this may impair proper functioning.



2 Fit the muffler (B) to the expiratory valve.

3 Fit the diaphragm (A) onto the edge of the expiratory valve housing.



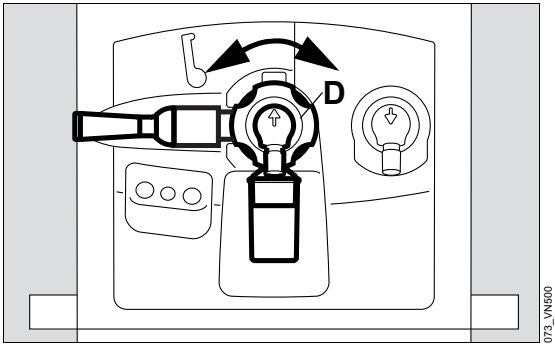
4 Fit the collection container for the water trap (C).

Inserting the expiratory valve into Babylog VN500

Prerequisite: The flap on the front is pivoted upwards.

1 Turn the locking ring (D) as far as possible to the left.

2 Push the expiratory valve into the fitting.



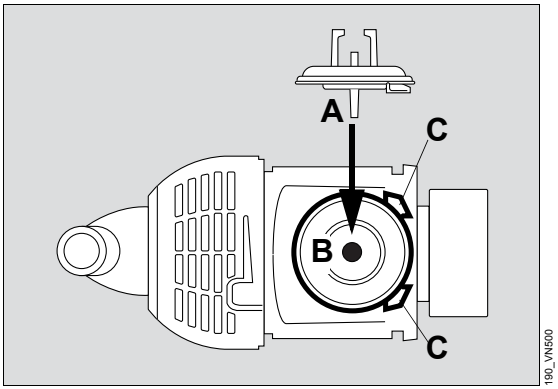
3 Turn the locking ring (D) as far as it will go to the right until it clicks audibly into place.

4 Check that it is properly secured by gently pulling on the expiratory valve.

5 Close the flap.

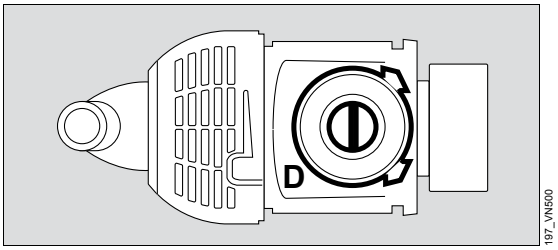
Assembling the inspiratory unit

1 Make sure the inspiratory unit and diaphragm are completely dry, otherwise this may impair proper functioning.



2 Insert the adapter (A) of the diaphragm into the opening of the fitting (B). The adapter must be able to slightly move up and down in the opening.

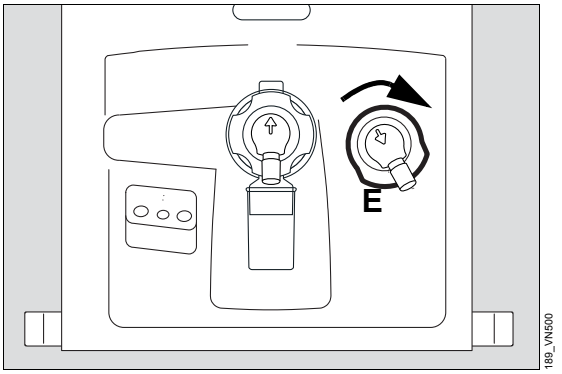
3 Position the diaphragm in such a way that it is in the recesses (C) of the fitting.



4 Fit the diaphragm onto the edge of the fitting (D).

Inserting the inspiratory unit into Babylog VN500

1 Insert the inspiratory unit (E) into the recesses of the fitting and push as far as it will go into the fitting.



2 Turn the inspiratory unit in clockwise direction until the lock clicks into place.

3 Check whether the inspiratory unit is properly engaged.

Assembling accessories

Assemble the medication nebulizer and breathing gas humidifier in accordance with the corresponding Instructions for Use.

- Connecting the medication nebulizer to the breathing circuit, see page 93.
- Preparing the breathing gas humidifier, see page 47.

Before reusing on patient

1 For information on assembling the equipment, see chapter "Assembly and preparation" on page 37.

2 For information on checking readiness for operation, see chapter "Getting started" on page 57.

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Maintenance

Overview

This chapter describes all maintenance steps necessary to maintain the proper functioning of the device. These maintenance steps must be performed by service personnel.

CAUTION
Clean and disinfect device or device parts before each maintenance step, also before returning for repair.

WARNING
Risk of electric shock

There are current-carrying components beneath the housing cover.

Do not remove the housing cover. Maintenance measures must be performed by service personnel or experts. Dräger recommends DrägerService to perform these tasks.

Definition of maintenance concepts

Concept	Definition
Maintenance	Appropriate measures intended to retain the specified condition of a medical device
Inspection	Measures intended to determine and assess the actual state of a medical device
Preventive maintenance	Repeated indicated measures intended to retain the specified condition of a medical device
Repair	Measures intended to restore the functional condition of a medical device after the failure of a device function

Inspection

Inspections must be carried out regularly according to the following specifications and in the specified intervals.

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

Remote Service

From software release SW 2.20, Babylog VN500 supports the following Remote Service functionalities:
– Help Ticket
– Remote Device Check

Contact the responsible DrägerService representative for further information on the Remote Service function.

Safety checks

The safety checks are no substitute for the preventive maintenance measures (including preventive replacement of wear parts) indicated by the manufacturer.

CAUTION
The safety checks must be carried out in the specified intervals. Otherwise, the correct functioning of the medical device may be impaired.

1 Check accompanying documents:
  – Instructions for Use are available.

2 Perform a functional test of the following features:
  – Perform a device check and a breathing circuit check according to the Instructions for Use.
  – Perform a functional test of the airway pressure measurement.
  – Perform a functional test of the flow measurement.
  – Perform a functional test of the batteries (Babylog VN500 or PS500).

3 Verify that the device combination is in good condition:
  – Labels complete and legible.
  – No visible damage.
  – Fuses which are accessible from the outside are in compliance with the specified values.

4 Check that the equipment of the medical device is complete according to the Instructions for Use.

5 Check electrical safety in accordance with IEC 62353.

6 Check safety features:
  – Correct functioning of the emergency expiratory valve: Pressure rise 1.9 to 4.4 mbar (1.9 to 4.4 cmH_2O) at a flow of 4.5 to 5.5 L/min.
  – Correct functioning of the non-return valve in the expiratory valve.
  – Correct functioning of the emergency breathing valve: Maximum pressure drop of 6.5 mbar (6.5 cmH_2O) at a suction flow of 60 to 65 L/min.
  – Check the correct functioning of the alarm generator.
  – Check the correct functioning of the non-return valves in the gas inlet for O_2 and Air.

Preventive maintenance

WARNING

Risk due to defective components

Device malfunction can occur due to wear and material fatigue of components. To maintain the function of all components, this device must be inspected and serviced at the intervals specified by the manufacturer.

Maintenance intervals

Component	Interval	Measure	Personnel responsible
Ambient air filter	Every 4 weeks	Replacement or Cleaning, see "Replacing the ambient air filter" on page 215	Users
Diaphragm of the expiratory valve	Every 12 months	Replacement, see "Exchanging the diaphragm of the expiratory valve" on page 215	Users
GS500: Air filter of blower unit	Every 12 months	Exchange	Service personnel
GS500: Filter mat	Every 12 months	Exchange	Service personnel
Batteries (Babylog VN500 or PS500)	Every 12 months	Check capacity; replace battery if necessary	Service personnel
	Every 2 years	Replace battery	
Air filter (in the Air gas inlet)	Every 2 years	Exchange	Service personnel
O_2 filter (in the O_2 gas inlet)	Every 6 years	Exchange	Service personnel

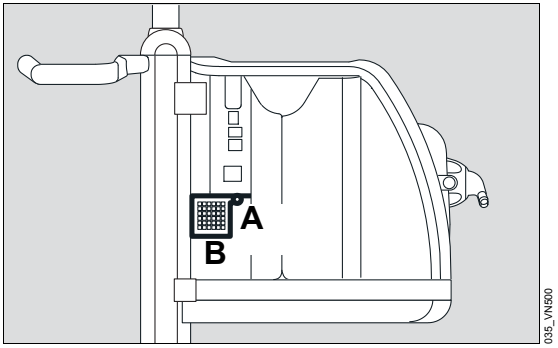
Repair

Dräger recommends that all repairs are carried out by DrägerService and that only original Dräger parts are used.

Replacing the ambient air filter

CAUTION
Replace the ambient air filter at regular intervals. Otherwise operation of the device may be impaired.

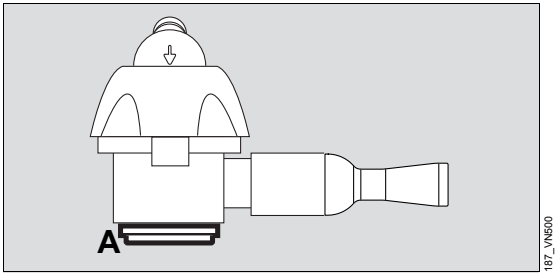
Clean or exchange if soiled or after 4 weeks at the latest. Exchange after 1 year at the latest.



1. Unscrew the screw (A) on the cover of the ambient air filter.
2. Open the cover (B).
3. Remove the filter from the mount.
4. Fit a new filter or clean the old filter in warm soapy water and dry thoroughly.
5. Insert the filter into the mount without creasing.
6. Close the cover (B) and retighten the screw (A).
7. Dispose of used filter with domestic waste.

Exchanging the diaphragm of the expiratory valve

Prerequisite: The expiratory valve has been removed, see "Removing the expiratory valve" on page 198.



1. Remove the diaphragm (A).
2. Fit the new diaphragm onto the edge of the expiratory valve housing. Make sure that the diaphragm is fitted properly.
3. Dispose of used diaphragm with domestic waste.
4. Fit the expiratory valve, see "Inserting the expiratory valve into the ventilation unit" on page 46.

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Disposal

Safety information on disposal

CAUTION
The device and its components must be disinfected and cleaned before disposal!

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

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

Disposal of packaging material

Dispose of the packaging material of the device and the accessories listed in the list of accessories in accordance with the applicable laws and regulations.

Disposal of batteries

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

The medical device contains batteries with toxic substances.
In the Federal Republic of Germany: The user is obliged by the ordinance on the return and disposal of used batteries to return batteries which contain toxic substances either to the manufacturer/sales outlet or to a collection center operated by public waste disposal corporations. The battery installed in the device must therefore be removed by service personnel before the apparatus can be disposed of. Observe the applicable laws and regulations for battery disposal.

Disposal of neonatal flow sensor

The flow sensor must be disposed of as infectious waste. Low-emission combustion at over 800 °C (1472 °F).

Disposal of the medical device

When disposing of the medical device:

- Consult the relevant waste disposal company for appropriate disposal.
- Observe the applicable laws and regulations.

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Technical data

Ambient conditions

During operation	
Temperature	10 to 40 °C (50 to 104 °F). For ambient temperatures above 35 °C (95 °F) the charging process of the battery of PS500 may be limited or interrupted.
Atmospheric pressure	700 to 1060 hPa (10.2 to 15.3 psi)
Relative humidity	10 to 90 %, without condensation
During storage and transportation	
Temperature	–20 to 60 °C (–4 to 140 °F)
Atmospheric pressure	500 to 1060 hPa (7.3 to 15.3 psi)
Relative humidity	5 to 95 %, without condensation

Depending on the accessories used, more stringent ambient conditions can apply. Observe the corresponding Instructions for Use.

Setting values

The required parameters can be adjusted with the therapy controls of Babylog VN500 without any loss of accuracy. For certain parameters, the measured values could deviate from the set values, e.g., O_2 concentration and VT.

Respiratory rate ***RR***	0.5 to 150/min
Inspiratory time ***Ti***	0.1 to 3 s
Maximum inspiratory time for flow cycled breaths	***Timax***
Pediatric patients	0.1 to 4 s
Neonates	0.1 to 1.5 s
Tidal volume	***VT***
Pediatric patients	20 to 300 mL
Neonates	2 to 100 mL
Tidal volume for pressure support	***VT***
Pediatric patients	20 to 300 mL
Neonates	2 to 100 mL
Upper limit of tidal volume for PPS	***VTmax***
Pediatric patients	20 to 300 mL
Neonates	2 to 100 mL

Setting values (cont.)

Activation state of Apnea Ventilation	on, off
Activation state of the function ***Automatic return from Apnea Ventilation***	on, off
Tidal volume during Apnea Ventilation	***VTapn***
Pediatric patients	20 to 300 mL
Neonates	2 to 100 mL
Respiratory rate during Apnea Ventilation ***RRapn***	2 to 150/min
Inspiratory flow	***Flow***
Pediatric patients	2 to 30 L/min
Neonates	2 to 30 L/min
Inspiratory pressure ***Pinsp***	1 to 80 mbar (or hPa or cmH_2O)
Inspiratory pressure limit ***Pmax***	2 to 100 mbar (or hPa or cmH_2O)
O_2 concentration ***FiO_2***	21 to 100 Vol%
Positive end-expiratory pressure ***PEEP***	0 to 35 mbar (or hPa or cmH_2O)
Trigger sensitivity ***Flow trigger***	0.2 to 5 L/min
Pressure support ***Psupp***	0 to 80 mbar (or hPa or cmH_2O)
Rise time for pressure support	***Slope***
Pediatric patients	0 to 2 s
Neonates	0 to 1.5 s
Airway Pressure Release Ventilation	***APRV***
Inspiratory time ***Thigh***	0.1 to 30 s
Expiratory time ***Tlow***	0.05 to 30 s
Maximum time of low pressure level in APRV/PEF ***Tlow max***	0.05 to 30 s
Inspiratory pressure ***Phigh***	1 to 80 mbar (or hPa or cmH_2O)
Expiratory pressure ***Plow***	0 to 35 mbar (or hPa or cmH_2O)
Termination criterion (peak expiratory flow) ***Exp. term.***	1 to 80 %PEF
Automatic Tube Compensation	***ATC***
Inner diameter of the tube	***Tube Ø***
Endotracheal tube	***ET***
Pediatric patients	2 to 8 mm (0.08 to 0.31 in)
Neonates	2 to 5 mm (0.08 to 0.2 in)
Tracheostomy tube	***Trach.***
Pediatric patients	2.5 to 8 mm (0.1 to 0.31 in)
Degree of tube compensation ***Compens.***	0 to 100 %

Setting values (cont.)

Activation state of ATC during mandatory inspirations ***Inspiratory compensation***	on / off
Activation state of ATC during expiratory phases ***Expiratory compensation***	on / off
Proportional Pressure Support	***PPS***
Flow Assist ***Flow Assist***	
Pediatric patients	0 to 100 mbar/L/s (or hPa/L/s or cmH_2O/L/s)
Neonates	0 to 300 mbar/L/s (or hPa/L/s or cmH_2O/L/s)
Volume Assist ***Vol. Assist***	
Pediatric patients	0 to 1000 mbar/L (or hPa/L or cmH_2O/L)
corresponds to compliance compensation	10000 to 1 mL/mbar (or mL/hPa or mL/cmH_2O)
Neonates	0 to 4000 mbar/L (or hPa/L or cmH_2O/L)
corresponds to compliance compensation	1000 to 0.3 mL/mbar (or mL/hPa or mL/cmH_2O)
O_2 therapy	
Continuous Flow ***Flow*** (BTPS)	2 to 50 L/min
O_2 concentration ***FiO_2***	21 to 100 Vol%
Leakage compensation	on / off On: full compensation active Off: only trigger compensation active
Maneuver settings	
Sigh pressure ***⊿intPEEP***	0 to 20 mbar (or hPa or cmH_2O)
Time interval between sighs ***Interval sigh***	20 s to 180 min
Number of cycles for a sigh ***Cycles sigh***	1 to 20 exhalations
Oxygen enrichment for suction maneuver	
Factor for neonates	1 to 2
Factor for pediatric patients	1 to 2

Performance characteristics

Control principle	time-cycled, volume-constant, pressure-controlled
Intermittent PEEP duration	1 to 20 expiratory cycles
Medication nebulization	for 5, 10, 15, 30 minutes
Endotracheal suction	
Disconnection detection	automatic
Reconnection detection	automatic

Performance characteristics (cont.)

Initial oxygen enrichment	max. 3 minutes
Active suction phase	max. 2 minutes
Final oxygen enrichment	max. 2 minutes
Supply system for spontaneous breathing and Psupp	adaptive CPAP system with high initial flow
Inspiratory flow (BTPS)	max 60 L/min
Base flow, neonates	6 L/min
Base flow, pediatric patients	3 L/min
Resistance is specified for the breathing circuit, i.e. between the safety valve, the expiratory valve, and the Y-piece. Resistances account for humidifiers as applicable but do not account for additional accessories such as bacterial filters, HME, neonatal flow sensor or CO_2 cuvettes. Resistances for these accessories are given in the list of accessories.	
Inspiratory resistance	
During operation with Fisher & Paykel humidifier	
Pediatric patients, maximum value	<6 mbar at 15 L/min <6 hPa at 15 L/min <6 cmH_2O at 15 L/min
Neonates, maximum value	<1.2 mbar at 5 L/min <1.2 hPa at 5 L/min <1.2 cmH_2O at 5 L/min
Following device failure with Fisher & Paykel humidifier	
Pediatric patients, maximum value	<13 mbar at 30 L/min <13 hPa at 30 L/min <13 cmH_2O at 30 L/min
Neonates, maximum value	<1.5 mbar at 5 L/min <1.5 hPa at 5 L/min <1.5 cmH_2O at 5 L/min
Expiratory resistance	
During operation	
Pediatric patients, maximum value	<4.5 mbar at 15 L/min <4.5 hPa at 15 L/min <4.5 cmH_2O at 15 L/min

Performance characteristics (cont.)

Neonates, maximum value	<1.2 mbar at 5 L/min <1.2 hPa at 5 L/min <1.2 cmH_2O at 5 L/min
Following device failure	
Pediatric patients, maximum value	<5.0 mbar at 30 L/min <5.0 hPa at 30 L/min <5.0 cmH_2O at 30 L/min
Neonates, maximum value	<1.0 mbar at 5 L/min <1.0 hPa at 5 L/min <1.0 cmH_2O at 5 L/min
Compliance of device incl. breathing circuit	
Neonates, maximum value	<1.3 mL/mbar <1.3 mL/hPa <1.3 mL/cmH_2O
Additional functions	
Safety valve	Opens if medical compressed air supply fails (supply gas flow is not sufficient to provide the inspiratory flow required), enables spontaneous breathing with ambient air.

Displayed measured values

Accuracy does only apply for the measurement range specified.	
Airway pressure measurement	
Positive end-expiratory pressure	***PEEP***
Peak Inspiratory Pressure	***PIP***
Mean airway pressure	***Pmean***
Minimum airway pressure	***Pmin***
Lower pressure level in APRV	***Plow***
End-inspriatory pressure for mandatory breaths	***EIP***
Upper pressure level in APRV	***Phigh***
Range	within the setting range of 0 to a maximum of 80 mbar (or hPa or cmH_2O) (within the maximum sensor measuring range of –60 to 120 mbar (or hPa or cmH_2O))

Displayed measured values (cont.)

Accuracy	±6 % of measured value, or ±0.5 mbar (or hPa or cmH_2O), whichever is greater
T0...90 (for Pmean)	33 s for intubated patients and 20 s with NIV
O_2 measurement (inspiratory side)	
Inspiratory O_2 concentration (in dry air)	***FiO_2***
Range	18 to 100 Vol%
Accuracy	±3 Vol% at 20 °C (68 °F)
Drift of measurement accuracy	0.2 Vol% per month (The measured values from the O_2 measurement are compensated for barometric pressure)
T0...90	<30 s
Warm-up time	max. 3 minutes, typ. 1 minute
Flow measurement (proximal)	
Minute volume measurement	
Expiratory minute volume	***MVe***
Inspiratory minute volume	***MVi***
Mandatory expiratory minute volume	***MVemand***
Spontaneous expiratory minute volume	***MVespon***
Minute volume, leakage-compensated	***MV***
Range	0 to 30 L/min BTPS
Accuracy	measured with neonatal flow sensor: ±10 % of measured value or ±0.6 mL, whichever is greater, calibration during device check (at 1013 mbar (1013 cmH_2O), gas with 50 % rel. humidity, 23 °C (73.4 °F)), no leakage and using a Dräger Y-piece
T0...90	
Pediatric patients	33 s
Neonates	20 s
Tidal volume measurement	
Tidal volume	***VT***
Inspiratory tidal volume (not leakage-compensated) of mandatory breaths	***VTimand***
Expiratory tidal volume (not leakage-compensated) of mandatory breaths	***VTemand***
Inspiratory tidal volume (not leakage-compensated) of spontaneous breaths	***VTispon***

Displayed measured values (cont.)

Range	0 to 1000 mL BTPS
Accuracy	measured with neonatal flow sensor: ±10 % of measured value or ±0.6 mL, whichever is greater, calibration during device check (at 1013 mbar (1013 cmH_2O), gas with 50 % rel. humidity, 23 °C (73.4 °F)), no leakage and using a Dräger Y-piece
Respiratory rate measurement	
Respiratory rate	***RR***
Mandatory respiratory rate	***RRmand***
Portion of mandatory triggered breaths	***RRtrig***
Spontaneous respiratory rate	***RRspon***
Range	0 to 300/min
Accuracy	±1/min for respiratory rates ≥2/min and ±2/min for respiratory rates <2/min
T0...90	33 s
Effective inspiratory time during spontaneous breathing ***Tispon***	0 to 20 s
Effective expiratory time, only if additional setting ***AutoRelease*** is active ***Tlow***	0 to 20 s
Inspiratory time to expiratory time ratio for mandatory ventilation ***I:E***	1:300 to 600:1
Inspiratory time to expiratory time ratio for spontaneous breathing ***I:Espon***	1:300 to 600:1
Leakage in %	0 to 100 %
CO_2 measurement in mainstream	
Interference with gases and vapors	
Freon R21 100 Vol%	0.07 Vol%
Freon R134a 100 Vol%	0.19 Vol%
Ethanol 4 ‰ (concentration in blood)	0.00 Vol%
Isopropanol 1 Vol%	0.00 Vol%
Acetone 1 ‰ (concentration in blood)	0.00 Vol%
Methane 3 Vol%	<0.02 Vol%
End-expiratory CO_2 concentration	***etCO2***
Range	0 to 100 mmHg or 0 to 13.2 Vol% (at 1013 mbar (1013 cmH_2O)) or 0 to 13.3 kPa

Displayed measured values (cont.)

Accuracy	±2.0 mmHg in the range 0 to 40 mmHg, ±5 % of the measured value in the range 41 to 100 mmHg ±0.27 kPa in the range 0 to 5.33 kPa, ±5 % of the measured value in the range 5.34 to 13.3 kPa ±0.26 Vol% in the range 0 to 5.26 Vol%, ±5 % of the measured value in the range 5.27 to 13.2 Vol%
Drift of measurement accuracy	<0.02 Vol% (at 5.26 Vol%) <0.2 mmHg (at 40 mmHg) <0.02 kPa (at 5.33 kPa) over 6 h (the measured CO_2 values are barometrically pressure compensated)
T10...90	≤30 ms
Total response time	170±20 ms
Warm-up time, typical	3 min

With reference to the displayed measured values, the following dead space volumes must be taken into account:

CO_2 cuvette, pediatric patients (6870280, MP01063)	1.9 mL
Neonatal flow sensor ISO 15 (8411130)	0.9 mL
Neonatal flow sensor Y-piece (8410185)	1.7 mL

Displayed calculated values

Compliance	***C***
Range	0 to 650 mL/mbar (mL/cmH_2O)
Resistance	***R***
Range	0 to 1000 mbar/(L/s) (or hPa/(L/s) or cmH_2O/(L/s))
Patient resistance	***Rpat***
Range	0 to 1000 mbar/(L/s) (or hPa/(L/s) or cmH_2O/(L/s))
Leakage minute volume	***MVleak***
Range	0 to 30 L/min BTPS
Accuracy	±10 % of measured value
T0...90	33 s for intubated patients and 20 s with NIV
Spontaneous portion of minute volume in percent ***%MVspon***	0 to 100 %
Rapid Shallow Breathing	***RSB***
Range	
Pediatric patients	0 to 9999 (/min/L)
Neonates	0 to 9999 (/min/mL)
For accuracy, see measurement of ***VT*** and ***RR***	
Expiratory CO_2 concentration etCO_2	0 to 100 mmHg or 0 to 13.2 Vol% (at 1013 mbar (1013 cmH_2O)) or 0 to 13.3 kPa
Curve displays	
Airway pressure Paw (t)	–30 to 100 mbar (or hPa or cmH_2O)
Flow (t)	–40 to 40 L/min
Volume V (t)	2 to 300 mL
CO_2 (t)	0 to 100 mmHg or 0 to 13.2 Vol% (at 1013 mbar (1013 cmH_2O)) or 0 to 13.3 kPa

Monitoring

Alarm sound pressure level $L_{(A)}$ at operators position: Operators position: at front of device at a distance of 1 m (39 in) and a height of 1.5 m (59 in). Free field measurement in accordance with ISO 3744.	
Alarm tone sequence ***IEC/CEI***	
Range for high-priority alarms	about 54 dB(A) to 75 dB(A)
Range for medium-priority alarms	about 47 dB(A) to 72 dB(A)
Range for low-priority alarms	about 42 dB(A) to 69 dB(A)
Incrementation	adjustable in 10 increments
Alarm tone sequence ***Dräger ventilation***	
Range for high-priority alarms	about 56 dB(A) to 81 dB(A)
Range for medium-priority alarms	about 54 dB(A) to 79 dB(A)
Range for low-priority alarms	about 49 dB(A) to 77 dB(A)
Incrementation	adjustable in 10 increments
Alarm sound pressure level for power failure alarm and auxiliary alarm	about 70 dB(A) to 75 dB(A)
Expiratory minute volume	***MVe***
Upper alarm limit alarm	if the upper alarm limit has been exceeded
Setting range in invasive ventilation	0.03 to 41 L/min
Setting range in non-invasive ventilation	0.03 to 60 L/min
Alarm delay	***MV delay***
Pediatric patients	0 to 20 s
Neonates	0 to 15 s
Lower alarm limit alarm	if the value has fallen below the lower alarm limit
Setting range	0.02 to 40 L/min, Off (NIV)
Alarm suppression	2 min after leaving standby during and 2 min after suction maneuver 2 minutes after switching on flow monitoring
Alarm delay	***MV delay***
Pediatric patients	0 to 20 s
Neonates	0 to 15 s
Airway pressure	***Paw***
Upper alarm limit alarm	if the upper alarm limit has been exceeded
Setting range	7 to 105 mbar (or hPa or cmH_2O)
Maximum airway pressure	120 mbar (or hPa or cmH_2O)

Monitoring (cont.)

Insp. O_2 concentration	***FiO_2***
Upper alarm limit alarm	if the upper alarm limit is exceeded for at least 30 seconds
Lower alarm limit alarm	if the value falls below the lower alarm limit for at least 30 seconds
Setting range	both alarm limits are automatically assigned to the set value: below 60 Vol% at ±4 Vol%, from 60 Vol% at ±6 Vol% (Lower alarm limit is 18 Vol% at 21 Vol%)
End-expiratory CO_2 concentration	***$etCO_2$***
Upper alarm limit alarm	if the upper alarm limit has been exceeded
Setting range	1 to 98 mmHg (or 0.1 to 13.1 Vol% or 0.1 to 13.3 kPa)
Lower alarm limit alarm	if the value has fallen below the lower alarm limit
Setting range	0 to 97 mmHg (or 0 to 13.0 Vol% or 0 to 13.2 kPa)
Respiratory rate	***RR***
Upper alarm limit alarm	if the respiratory rate (mandatory and spontaneous breaths) has been exceeded
Setting range	5 to 200/min, Off
Volume monitoring	***VT***
Lower alarm limit alarm	if the set tidal volume has not been supplied
Setting range	90 % of VT set (only for modes with VG)
Alarm suppression	
Pediatric patients	during the first five consecutive breaths where the applied inspiratory tidal volume has fallen below the lower alarm limit
Neonates	during the first eight consecutive breaths where the applied inspiratory tidal volume has fallen below the lower alarm limit
Apnea alarm time	***Tapn***
Alarm	if no breathing activity is detected
Setting range	5 to 60 seconds, Off
Disconnect alarm delay time	***Tdisconnect***
Setting range	0 to 60 seconds

Operating data

Mains power supply	
Mains power connection	100 V to 240 V 50/60 Hz
Current consumption	
at 230 V	max. 0.8 A Ventilation Unit with Medical Cockpit max. 1.4 A with GS500 max. 0.8 A with PS500 max. 1.4 A with GS500 and PS500
at 100 V	max. 1.8 A Ventilation Unit with Medical Cockpit max. 3.0 A with GS500 max. 1.8 A with PS500 max. 3.0 A with GS500 and PS500
Power consumption	
maximum	175 W Ventilation Unit with Medical Cockpit 300 W with GS500 175 W with PS500 300 W with GS500 and PS500
in operation, without charging of internal battery	approx. 100 W Ventilation Unit with Medical Cockpit approx. 180 W with GS500 approx. 100 W with PS500 approx. 180 W with GS500 and PS500
Device fuses	
Range 100 V to 240 V	F6.3H 250V IEC 60127-2/V (2 pcs.) Ventilation Unit T1 250V 1.6A (2 pcs.) GS500, if separate mains plug is available
Protection class	
Ventilation Unit Babylog VN500 Medical Cockpit Infinity C500 Gas supply unit GS500 Power supply unit PS500	Class I
CO_2 sensor (sensor connected)	Type BF
Proximal flow sensor (sensor connected)	Type BF
Internal battery for Ventilation Unit (without PS500)	
Type	NiMH battery, sealed, maintenance-free
Fuse	F15A 80V UL248
Capacity	2.5 Ah
Voltage	24 V
Current	0 to 15 A

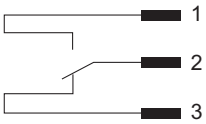
Operating data (cont.)

Time bridged if mains power supply is not available,	
with new battery at typical ventilation (without GS500), after a charging time of >4 hours	min. 30 minutes
with new battery at typical ventilation (with GS500), after a charging time of >4 hours	min. 15 minutes
Charging	
Charging time (to charge battery completely)	min. 4 hours
Charging power	max. 50 W
Batteries of power supply unit PS500	
Type	VRLA batteries, maintenance-free (VRLA = Valve Regulated Lead Acid)
Capacity	30 Ah
Voltage	24 V
Time bridged if mains power supply is not available,	
with new batteries at typical ventilation (without GS500), after a charging time of >11 hours	360 minutes
with new batteries at typical ventilation (with GS500), after a charging time of >11 hours	180 minutes
Charging	
Charging time (to charge battery completely)	min. 11 hours
Charging power	max. 50 W
Gas supply	
O_2 pressure	2.7 to 6.0 bar (or 270 to 600 kPa or 39 to 87 psi)
O_2 peak input flow	130 L/min (at 2.8 bar (40.6 psi) input pressure) 180 L/min (at 4.0 bar (58.0 psi) input pressure)
O_2 connection	depending on configuration: DIN, NIST, DISS, Air Liquide
Air pressure	2.7 to 6.0 bar (or 270 to 600 kPa or 39 to 87 psi)
Air peak input flow	130 L/min (at 2.8 bar (40.6 psi) input pressure) 180 L/min (at 4.0 bar (58.0 psi) input pressure)
Air connection	depending on configuration: DIN, NIST, DISS, Air Liquide

Operating data (cont.)

Dew point	5 °C (9 °F) below ambient temperature
Oil concentration	<0.1 mg/m^3
Particle size	Dust-free air (filtered with pore size <1 µm)
Gas consumption	
Consumption for ventilation	Depends on ventilation settings
Consumption for pneumatic medication nebulizer	Medical air or O_2 max. 2.1 bar (or 210 kPa or 30.5 psi), max. 11 L/min
Automatic gas switch-over	if one gas fails, the device switches to the other gas
Sound pressure level of device during typical ventilation (measured at operator's position in a free-field in accordance with ISO 3744 at a distance of 1 m (39 in) and at a height of 1.5 m (59 in))	
Mean sound pressure level $L_{eq(A)}$	≤45 dB(A) ≤50 dB(A) with GS500
Mean sound pressure level $L_{eq(A)}$	≤45 dB(A) for conventional ventilation
Dimensions (W x H x D)	
Babylog VN500 and Infinity C500	420 mm x 685 mm x 410 mm (16.5 in x 27.0 in x 16.1 in)
Babylog VN500 and Infinity C500 on trolley	577 mm x 1400 mm x 677 mm (22.7 in x 55.1 in x 26.7 in)
Weight	
Babylog VN500 and Infinity C500	approx. 25 kg (55.1 lbs)
Babylog VN500 and Infinity C500 on trolley	approx. 59 kg (130 lbs)
PS500	approx. 27 kg (59.5 lbs)
GS500	approx. 10.5 kg (23 lbs)
Maximum load	
Trolley	100 kg (220.5 lbs)
Universal holder with standard rail	10 kg (22.1 lbs)
Humidifier holder 8416325	10 kg (22.1 lbs)
Humidifier holder G93111	8 kg (17.6 lbs)
Electromagnetic compatibility EMC	tested in accordance with IEC 60601-1-2
Classification according to EC Directive 93/42/EEC, Annex IX	II b
UMDNS code Universal Medical Device Nomenclature System - Nomenclature for medical devices	17-429

Operating data (cont.)

Materials used	
Breathing hose (reusable)	Silicone rubber (milky, transparent)
Water trap (reusable)	Polysulphone (gray, transparent)
Y-piece (reusable)	Polysulphone (yellow, transparent)
Expiratory valve (housing, closure, muffler)	Polyamide (white, blue)
Inspiratory unit (inspiratory port)	Polyamide (white, blue)
Diaphragm	Silicone rubber and nickel (whitish and gray)
Reusable CO_2 cuvette	Polysulphone with sapphire windows (gray violet, transparent: pediatric cuvette)
Disposable CO_2 cuvette	Styrene-butadiene copolymer SBC (blue, transparent: pediatric cuvette)
CO_2 sensor	Polysulphone (white)
CO_2 sensor cable	Polyurethane (gray)
For Nurse call	
Connection	via cable 8417370 only
Floating DC contact	
Input voltage	24 V DC max.
Input current	1 A DC max.
Switching capacity	15 W max.
Cable assignment 8417370 in alarm-free situation	 Cable 1 (normally open): white Cable 2 (common): brown Cable 3 (normally closed): green

Device ports

Outputs	
V1	System cable
V2, V3	not used
V4	Nurse call
V5	Neonatal flow sensor
V6	not used
V7	CO_2 sensor
V8	not used
V9	GS500
MEDIBUS or MEDIBUS.X protocol	
Baud rate	1200, 2400, 4800, 9600, 19200, 38400 baud (19200 and 38400 baud are required for transmitting high-speed data, e.g. for the flow waveform)
Data bits	8
Parity	even, odd, no
Stop bits	1 or 2
Pin assignment of COM1, COM2 and COM3	
Pin 1	DCD
Pin 2	RXD
Pin 3	TXD
Pin 4	DTR
Pin 5	GND
Pin 6	DSR
Pin 7, 8	RTS/CTS
Pin 9	RI
Housing	SHLD
Galvanic isolation	
V1	The port is not electrically isolated from the device electronics.
V2, V3	not used
V4	The port is not electrically isolated from the device electronics.
V5	The port is electrically isolated from the device electronics (Type BF). The test voltage for electrical isolation is 1500 V.
V6	not used

Device ports (cont.)

V7	The port is not electrically isolated from the device electronics.
V8	not used
V9	The port is electrically isolated from the device electronics. The test voltage for electrical isolation is 500 V.

Automatic alarm limits

The following tables describe the alarm limits which cannot be set by the user.

Alarm message	Description/Detection
Airway pressure high	The airway pressure is monitored to detect whether the upper alarm limit is exceeded. If the alarm limit indicating a too high airway pressure is linked to ventilation therapy controls, this limit is set 5 mbar (5 cmH_2O) above the highest pressure which is regularly applied during ventilation according to the user settings. This connection is switched on at the factory.
VT low	Under Volume Guarantee, 90 % of the set VT is not reached during eight consecutive breaths.
Breathing hose kinked (O_2 Therapy)	A too high pressure during an O_2 therapy is monitored. The alarm limit is set at 30 mbar (30 cmH_2O).
Airway pressure negative	Situations in which the pressure becomes negative are monitored. The alarm limit is set at –10 mbar (–10 cmH_2O).
PEEP high / Plow high	A too high PEEP or Plow value during ventilation is monitored. The alarm limit is 4 mbar (4 cmH_2O) above the set value for the PEEP or Plow level. For a set value ≤8 mbar (≤8 cmH_2O), the alarm limit is determined depending on the measured expiratory flow. However, in this case, the alarm limit is never greater than 12 mbar (12 cmH_2O). To avoid false alarms, the pressure is not monitored to detect whether the lower level has been reached if APRV and the Tlow value were set to less than 1 s. In this setting, the set Plow can often not be reached depending on the situation of the patient and the technical conditions. To avoid false alarms, the pressure is not monitored to detect whether the lower level has been reached if APRV and AutoRelease were set.

Alarm message	Description/Detection
PEEP high / Plow high	The alarm is not reliably detected under the following conditions: – The tube cuff has a large leakage. – The breathing circuit used has a high resistance, e.g., heated pediatric breathing circuit. As a result, a blocked expiratory bacterial filter cannot be detected.
PEEP low / Plow low	A too low PEEP or Plow value during ventilation is monitored. The alarm limit depends on the set value of the PEEP or Plow level. The alarm limit is smaller than the set value by 5 mbar (5 cmH_2O) in each case.
Pressure limited (ATC/PPS)	The upper pressure limit is monitored to detect whether it is reached when using ATC or PPS. If the ***Paw high*** alarm limit is adjustable, the alarm limit is derived from this value and lies in the range ***Paw high*** –5 mbar (–5 cmH_2O) to ***Paw high*** –1 mbar (–1 cmH_2O), depending on how closely the ***Paw high*** value comes to the currently applied ventilation. If the ***Paw high*** alarm limit is linked (***Pmax/Paw high autoset***), the pressure limit corresponds to the value of the ***Pmax*** therapy control.
Airway pressure low	A too low airway pressure is monitored by checking whether the integral over time of the undercut of the measured pressure level below the lower pressure level exceeds 22.5 mbar x s (22.5 cmH_2O x s).

Volume monitoring

Alarm message	Description/Detection
VT not reached, leakage	Volume-guaranteed breaths are monitored to detect whether the set volume is reached. The alarm limit is set at the set point.
Pressure limited	During ventilation with Volume Guarantee, breaths are monitored to detect whether the volume to be applied is reached if the applied ventilation pressure cannot automatically be increased any further. The alarm limit is set at the set value for the volume.

Monitoring of the breathing circuit and the patient connection

Alarm message	Description/Detection
Disconnection?	Disconnection is monitored by checking that the mandatory breaths reach a minimum pressure level. The alarm limit is derived from the set points for ventilation. During pressure-controlled ventilation, the alarm is triggered when the airway pressure is lower than the lower pressure level plus 50 % of the pressure difference between the upper and lower pressure levels. During pressure-supported ventilation, the alarm is triggered when the airway pressure is lower than the lower pressure level plus 30 % of the pressure difference between the upper and lower pressure levels. During ventilation with Volume Guarantee and volume support, the limit is 50 % of the pressure difference between the upper pressure level and the lower pressure level currently calculated by Babylog VN500. During volume-controlled ventilation, the pressure level is 5 mbar (5 cmH_2O) above PEEP. All pressure criteria become ineffective if a sufficient expiration has been detected. In the event of an excessive inspiratory flow at the current airway pressure, a disconnection due to excessive inspiratory volume is detected. This volume depends on the patient category: – 1.5 L in the patient category ***Ped. pat.*** – 0.5 L in the patient category ***Neo.***
Leakage	Leakages are monitored in the ***Ped. pat.*** patient category. The alarm limit is set at 55 % of relative leakage. Leakages during NIV are not monitored.
Airway obstructed?	Obstructions in the breathing circuit are monitored by observing the flow delivered to the patient during a defined period.

FiO_2 monitoring

Alarm message	Description/Detection
FiO_2 high	A too high O_2 concentration of the applied gas is monitored. The alarm limit is 4 Vol% above the set point if this is less than or equal to 60 Vol%. The alarm limit is 6 Vol% above the set point if this is greater than 60 Vol%.
FiO_2 low	A too low O_2 concentration of the applied gas is monitored. For a FiO_2 concentration of 21 Vol% the alarm limit is 18 Vol%. The alarm limit is 4 Vol% below the set point if this is greater than 21 Vol% and less than or equal to 60 Vol%. The alarm limit is 6 Vol% below the set point if this is greater than 60 Vol%.

CO_2 monitoring

Alarm message	Description/Detection
CO_2 sensor?	The correct functioning of the CO_2 sensor is monitored. An alarm is immediately generated in the event of a technical defect or if a sensor is not connected. An alarm is generated after 60 s if the sensor is removed from the cuvette or the sensor does not detect any breathing activity.

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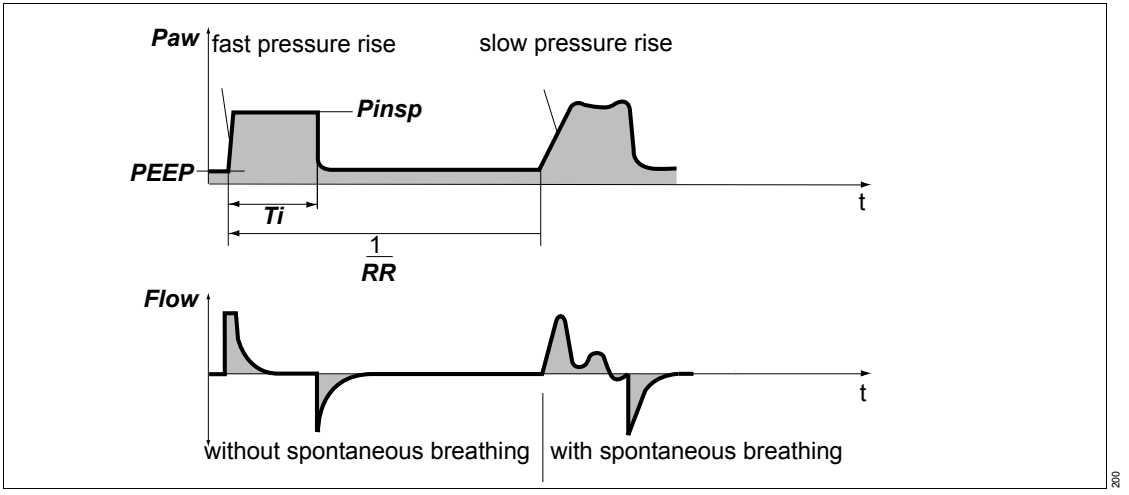
Principles of operation

Description of the ventilation modes

PC-CMV

Pressure Control-Continuous Mandatory Ventilation

Continuous pressure-controlled ventilation allowing spontaneous breathing (open system) during the entire respiratory cycle



Pressure-controlled ventilation

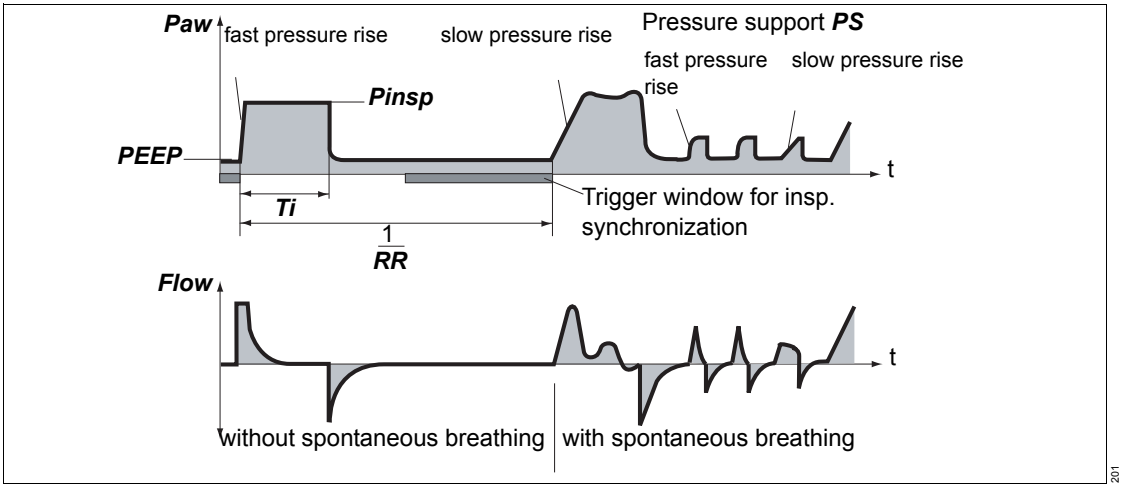
The upper pressure level is determined by ***Pinsp***. The duration of the mandatory breaths is determined by ***Ti***. As in all pressure-controlled ventilation modes, the tidal volume supplied depends on the difference in pressure "Pinsp – PEEP", the lung mechanics (resistance and compliance) and the patient's respiratory drive. The pressure rise from the lower pressure level ***PEEP*** to the upper pressure level ***Pinsp*** is determined by the ***Slope*** or ***Insp. flow*** setting. The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

The mandatory breaths are time-cycled and are not triggered by the patient. The number of mandatory breaths is determined by the respiratory rate ***RR***.

PC-SIMV

Pressure Control-Synchronized Intermittent Mandatory Ventilation

Intermittent, triggered, pressure-controlled ventilation allowing spontaneous breathing (open system) during the entire respiratory cycle



Pressure-controlled ventilation

The upper pressure level is determined by ***Pinsp***. The duration of the mandatory breaths is determined by ***Ti***. As in all pressure-controlled ventilation modes, the tidal volume supplied depends on the difference in pressure "Pinsp – PEEP", the lung mechanics (resistance and compliance) and the patient's respiratory drive. The pressure rise from the lower pressure level ***PEEP*** to the upper pressure level ***Pinsp*** is determined by the ***Slope*** or ***Insp. flow*** setting. The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

In the ***Neo.*** patient category, this mode is not available with non-invasive ventilation.

Synchronization

The mandatory breaths can be triggered by the patient's inspiratory effort from the PEEP level. By setting the trigger level, the mandatory breaths can be synchronized with the patient's inspiratory efforts.

A mandatory breath can only be triggered within a "trigger window" by the flow trigger in synchrony with the patient's spontaneous inspiratory effort. This prevents the mandatory breath being applied during expiration.

The trigger window 1.5 seconds long. For expiratory times shorter than 1.5 seconds, the trigger window covers the entire expiratory time minus a refractory period for the previous expiration.

Synchronization of mandatory breaths reduces the expiratory time. Babylog VN500 therefore extends the subsequent expiratory time or spontaneous breathing time by the missing time. This prevents an increase of the mandatory respiratory rate.

The number of mandatory breaths is determined by the respiratory rate ***RR***.

Pressure support

During spontaneous breathing from the PEEP level, the patient can be supported with ***PS***. Every inspiratory effort of the patient that meets the trigger criteria triggers a pressure-supported breath. By setting the trigger level, the patient's inspiratory efforts are synchronized. The time, number, and duration of pressure-supported breaths is determined by the patient's spontaneous breathing.

As in all pressure-controlled ventilation modes, the tidal volume supplied depends on the difference in pressure "Psupp – PEEP", the lung mechanics (resistance and compliance) and the patient's respiratory drive. The pressure rise from the lower pressure level ***PEEP*** to the upper pressure level ***Psupp*** is determined by the ***Slope*** or ***Insp. flow*** setting. The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

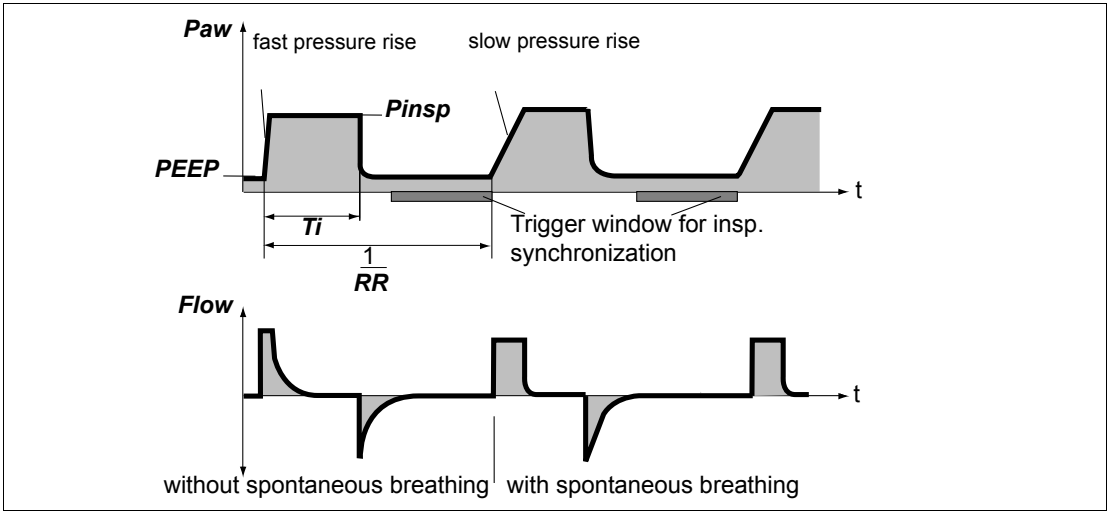
The pressure support is terminated as soon as the inspiratory flow falls below 15 % of the maximum inspiratory flow.

The pressure support is also terminated as soon as the duration of the support has reached the maximum inspiratory time. For intubated patients, the maximum inspiratory time in the ***Ped. pat.*** patient category is limited to 1.5 seconds. In the ***Neo.*** patient category, the maximum inspiratory time is limited to 130 % of ***Ti***, maximum of 1.5 seconds.

PC-AC

Pressure Control-Assist Control

Assist-controlled, pressure-controlled ventilation allowing spontaneous breathing during the entire respiratory cycle and backup respiratory rate



Pressure-controlled ventilation

The upper pressure level is determined by ***Pinsp***. The duration of the mandatory breaths is determined by ***Ti***. As in all pressure-controlled ventilation modes, the tidal volume supplied depends on the difference in pressure "Pinsp – PEEP", the lung mechanics (resistance and compliance) and the patient's respiratory drive. The pressure rise from the lower pressure level ***PEEP*** to the upper pressure level ***Pinsp*** is determined by the ***Slope*** or ***Insp. flow*** setting. The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

In the ***Neo.*** patient category, this mode is not available with non-invasive ventilation.

Assisted-controlled ventilation

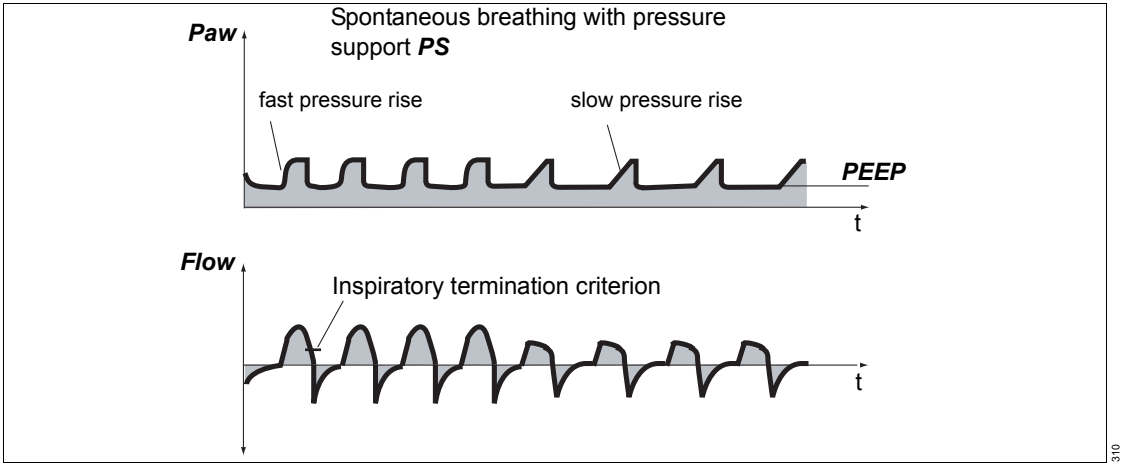
Every inspiratory effort of the patient from the PEEP level triggers a synchronized mandatory breath. Thus, the time and number of mandatory breaths are determined by the patient. The trigger window covers the expiratory time minus a refractory period for the previous expiration. The expiratory time is determined by the respiratory rate ***RR*** and the inspiratory time ***Ti***. A non-synchronized mandatory breath is triggered at the latest at the end of the expiratory time (back-up respiratory rate).

The minimum number of mandatory breaths is determined by the respiratory rate ***RR***.

PC-PSV

Pressure Control-Pressure Support Ventilation

Pressure-controlled ventilation with guaranteed minimum respiratory rate (backup respiratory rate)



Pressure support

During spontaneous breathing from the PEEP level, the patient can be supported with ***PS***. The level of pressure support is determined by ***Pinsp***. Every inspiratory effort of the patient that meets the trigger criteria triggers a pressure-supported breath. By setting the trigger level, the patient's inspiratory efforts are synchronized. The time, number, and duration of pressure-supported breaths is determined by the patient's spontaneous breathing. If the patient's respiratory rate is less than the set back-up respiratory rate ***RR*** or there is no spontaneous breathing present, the system administers time-cycled pressure-supported breaths with the respiratory rate ***RR***.

As in all pressure-controlled ventilation modes, the tidal volume supplied depends on the difference in pressure "Pinsp – PEEP", the lung mechanics (resistance and compliance) and the patient's respiratory drive. The pressure rise from the lower pressure level PEEP to the upper pressure level ***Pinsp*** is determined by the ***Slope*** or ***Insp. flow*** setting. The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

The pressure support is terminated as soon as the inspiratory flow falls below 15 % of the maximum inspiratory flow, see "Inspiratory termination" on page 260.

The pressure support is also terminated as soon as the duration of the support has reached the maximum inspiratory time.

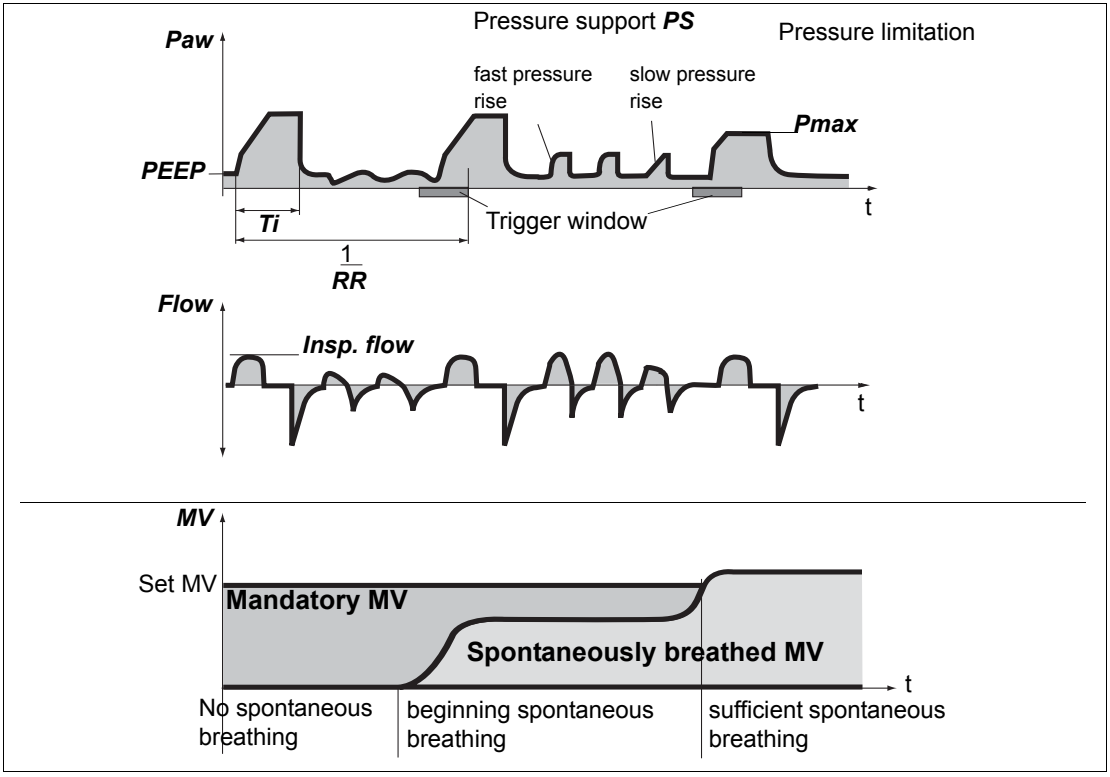
For intubated patients, the maximum inspiratory time in the ***Ped. pat.*** patient category is limited to 1.5 seconds. For the ***Neo.*** patient category, the maximum inspiratory time can be set with ***Timax*** to a maximum of 1.5 seconds.

In the case of non-invasive ventilation, the maximum duration of a breath for the ***Ped. pat.*** patient category can be set with ***Timax***. In the ***Neo.*** patient category, this mode is not available with non-invasive ventilation.

PC-MMV

Pressure Control-Mandatory Minute Volume Ventilation

Pressure-controlled ventilation to ensure minimum minute ventilation



Pressure-controlled ventilation with volume guarantee

The tidal volume of the mandatory breaths is determined by the volume ***VT***. The duration of the mandatory breaths is determined by ***Ti***. The pressure rise is determined by the ***Slope*** or ***Insp. flow*** setting. The maximum pressure that Babylog VN500 uses is set via the ***Pmax*** therapy control. If ***Pmax*** is not linked to the alarm limit ***Paw high***, the pressure can be limited using ***Paw high***.

In this case, the maximum applied pressure is limited to 5 mbar (5 cmH_2O) below ***Paw high***. If the maximum pressure allowed is not enough to deliver the set ***VT***, Babylog VN500 generates an alarm.

MMV works similar to SIMV, however, the mandatory breaths are only provided if spontaneous breathing is not sufficient and below the prescribed minimum ventilation. Should spontaneous breathing increase, fewer mandatory breaths will be provided. The minimum ventilation is determined by the setting of the tidal volume ***VT*** and the respiratory rate ***RR***.

The maximum number of mandatory breaths is determined by the respiratory rate ***RR***. However, this number is only provided when there is insufficient spontaneous breathing or an apnea is present.

Pressure support

During spontaneous breathing from the PEEP level, the patient can be supported with ***PS***. Every inspiratory effort of the patient that meets the trigger criteria triggers a pressure-supported breath. By setting the trigger level, the patient's inspiratory efforts are synchronized. The time, number, and duration of pressure-supported breaths is determined by the patient's spontaneous breathing.

As in all pressure-controlled ventilation modes, the tidal volume supplied depends on the difference in pressure "Psupp – PEEP", the lung mechanics (resistance and compliance) and the patient's respiratory drive. The pressure rise from the lower pressure level ***PEEP*** to the upper pressure level ***Psupp*** is determined by the ***Slope*** or ***Insp. flow*** setting. The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

The pressure support is terminated as soon as the inspiratory flow falls below 15 % of the maximum inspiratory flow.

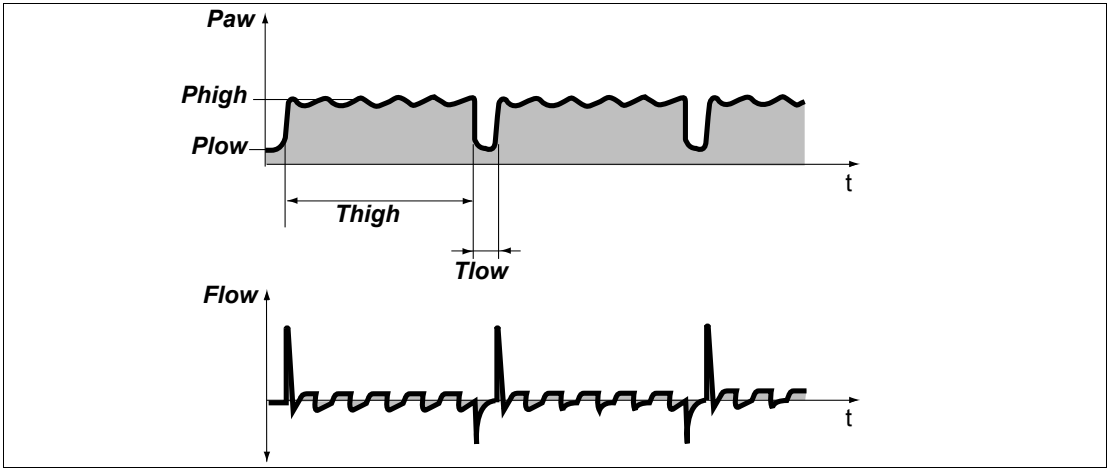
The pressure support is also terminated as soon as the duration of the support has reached the maximum inspiratory time. For intubated patients, the maximum inspiratory time in the ***Ped. pat.*** patient category is limited to 1.5 seconds. In the ***Neo.*** patient category, the maximum inspiratory time is limited to 130 % of ***Ti***, maximum of 1.5 seconds.

In the ***Neo.*** patient category, this mode is not available with non-invasive ventilation.

PC-APRV

Pressure Control-Airway Pressure Release Ventilation

Spontaneous breathing under continuous positive airway pressure with brief pressure releases



The patient breathes spontaneously at a high pressure level ***Phigh*** for an adjustable length of time ***Thigh***. For very short expiratory times ***Tlow***, Babylog VN500 switches to a low pressure level ***Plow***. The normal lung areas are emptied, but the "slow" lung areas only change volume to a lesser extent*.

The number of pressure releases is determined by the ***Thigh*** and ***Tlow*** settings. The releases are time-cycled and are not triggered by the patient. The duration is determined by ***Tlow***. The tidal volume exchanged during the release phases depends on the difference in pressure ***Phigh*** – ***Plow***, the lung mechanics (resistance and compliance) and the length of pressure release ***Tlow***. The pressure rise from the lower pressure level ***Plow*** to the upper pressure level ***Phigh*** is determined by the ***Slope*** or ***Insp. flow*** setting.

The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

During the activation of ***AutoRelease***, the duration of pressure releases is determined by the expiratory flow trace. The ***Exp. term.*** setting determines the percentage by which the expiratory flow must fall short of in relation to the peak flow for the ventilation to return to the high pressure level.

When ***AutoRelease*** is switched on, the change-over from the upper pressure level ***Phigh*** to the lower pressure level ***Plow*** is synchronized with the patient's spontaneous breathing.

Synchronization of the mandatory breath reduces the time on the upper pressure level.
Babylog VN500 prolongs the subsequent ventilation time on the upper pressure level by the missing time. This prevents an increase in respiratory rate.

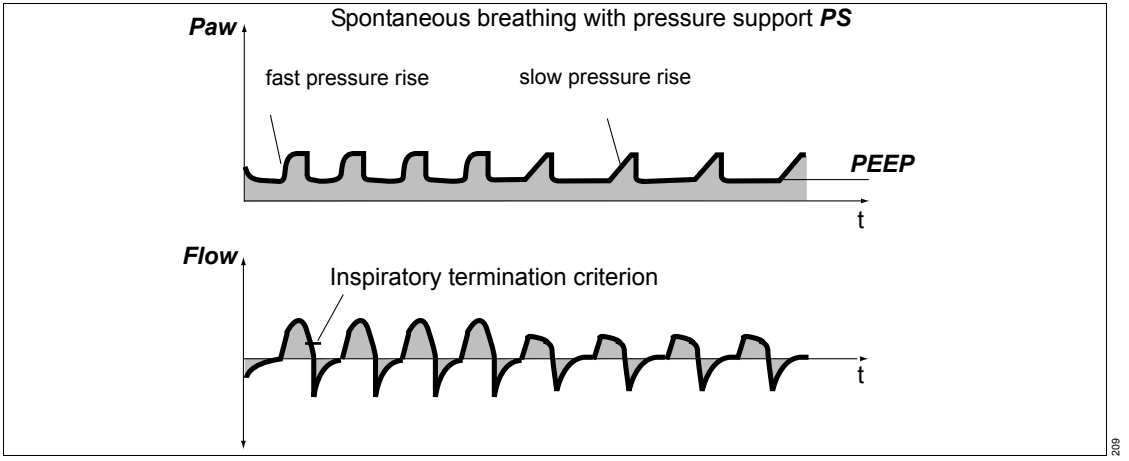
In the ***Neo.*** patient category, this mode is not available with non-invasive ventilation.

* Literature references [1], [2], [3], [4], see page 282.

SPN-CPAP/PS

Spontaneous-Continuous Positive Airway Pressure/Pressure Support

Spontaneous breathing with continuous positive pressure level with or without pressure support



When the pressure support is not switched on, the patient's spontaneous breathing is merely supported by an increased ***PEEP***.

During spontaneous breathing from the PEEP level, the patient can be supported with ***PS***. Every inspiratory effort of the patient that meets the trigger criteria triggers a pressure-supported breath. The time, number, and duration of pressure-supported breaths is determined by the patient's spontaneous breathing.

As in all pressure-controlled ventilation modes, the tidal volume supplied depends on the difference in pressure "Psupp – PEEP", the lung mechanics (resistance and compliance) and the patient's respiratory drive. The pressure rise from the lower pressure level ***PEEP*** to the upper pressure level ***Psupp*** is determined by the ***Slope*** or ***Insp. flow*** setting. The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

The pressure support is terminated as soon as the inspiratory flow falls below 15 % of the maximum inspiratory flow.

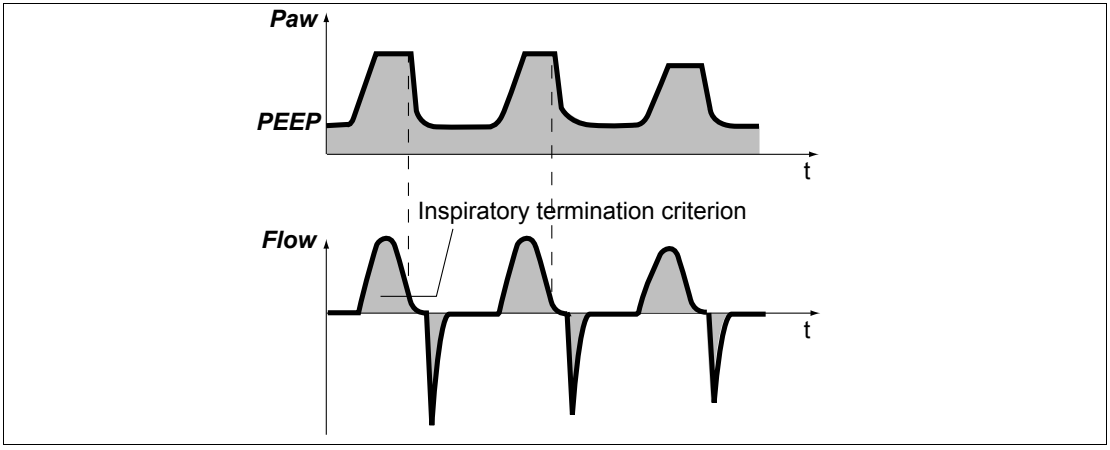
The pressure support is also terminated as soon as the duration of the support has reached the maximum inspiratory time. For intubated patients, the maximum inspiratory time in the ***Ped. pat.*** patient category is limited to 1.5 seconds. For the ***Neo.*** patient category, the maximum inspiratory time can be set with ***Timax*** to a maximum of 1.5 seconds. In the case of non-invasive ventilation, the maximum duration of support for the ***Ped. pat.*** patient category can be set with ***Timax***.

In the ***Neo.*** patient category, this mode is not available with non-invasive ventilation.

SPN-CPAP/VS

Spontaneous-Continuous Positive Airway Pressure/Volume Support

Spontaneous breathing with continuous positive pressure level with or without volume support



For volume support ***VS***, every inspiratory effort by the patient on the PEEP level that meets the trigger criteria triggers a volume-supported breath. By setting the trigger level, the patient's inspiratory efforts are synchronized. The time, number and duration of volume-supported breaths is determined by the patient's spontaneous breathing. The pressure rise is determined by the ***Slope*** or ***Insp. flow*** setting. The start setting can be configured on the page ***System setup > Ventilation > Start settings > Pressures, O_2, I:E***.

The volume support is terminated as soon as the inspiratory flow falls below 15 % of the maximum inspiratory flow.

The volume support is also terminated as soon as the duration of the support has reached the maximum inspiratory time. For intubated patients, the maximum inspiratory time in the ***Ped. pat.*** patient category is limited to 1.5 seconds. For the ***Neo.*** patient category, the maximum inspiratory time can be set with ***Timax*** to a maximum of 1.5 seconds. In the case of non-invasive ventilation, the maximum duration of support for the ***Ped. pat.*** patient category can be set with ***Timax***.

In the ***Neo.*** patient category, this mode is not available with non-invasive ventilation.

The set tidal volume of the supported breaths is reached through the automatically controlled pressure level of the volume support. With volume support, the support pressure is automatically adjusted to changes in lung conditions (resistance and compliance) and to the spontaneous breathing demand of the patient.

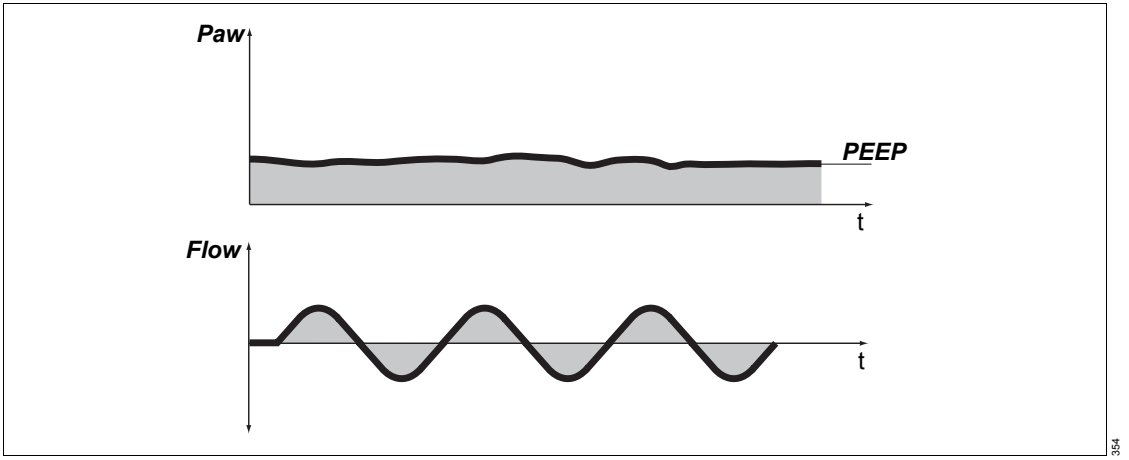
If *Paw high* is linked to the *Pmax* therapy control, set the maximum pressure that can be applied with the *Pmax* setting!

If *Paw high* is not linked to the *Pmax* therapy control, always set the *Paw high* alarm limit so that Babylog VN500 generates an alarm in the event of an increase in airway pressure due to compliance. The maximum pressure that can be applied is limited to 5 mbar (5 cmH_2O) below the upper alarm limit.

SPN-CPAP

Spontaneous-Continuous Positive Airway Pressure

Spontaneous breathing with continuous positive pressure level in the ***NIV*** application mode



The ***SPN-CPAP*** ventilation mode is only available with non-invasive ventilation in the ***Neo.*** patient category.

The patient's spontaneous breathing is supported with an increased PEEP.

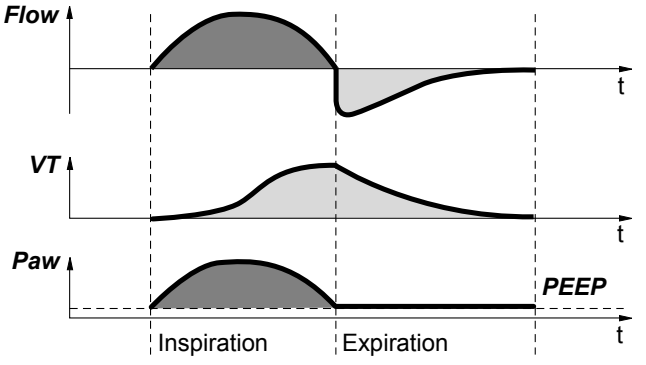
For the ***Manual inspiration/hold*** maneuver, the pressure of the breath is set with the ***PmanInsp*** therapy control and the duration of the breath is set with the ***TmanInsp*** therapy control.

SPN-PPS

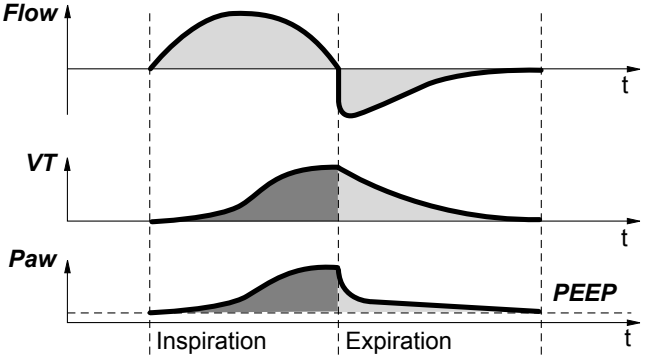
Spontaneous-Proportional Pressure Support

Spontaneous breathing with flow- and volume-proportional pressure support

Flow Assist: Pressure curve proportional to flow



Vol. Assist: Inspiratory pressure curve proportional to tidal volume VT



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In ventilation mode SPN-PPS, Babylog VN500 supports the patient's spontaneous breathing in proportion to the inspiratory effort. If the patient breathes strongly, Babylog VN500 supports this effort with high pressure support. If the patient has shallow breathing, Babylog VN500 reacts with low pressure support. Mechanical support is omitted altogether if there is no spontaneous breathing. Monitoring of apnea and minute volume must therefore be set appropriately.

The degree of support in PPS mode can be set separately according to the resistive and elastic components. The amount of resistive unloading by Babylog VN500 is determined by the user through the resistive ***Flow Assist*** component. The amount of elastic unloading to be taken over by Babylog VN500 is determined by the user through the elastic ***Vol. Assist*** component. This support is only effective during inspiration.

The tidal volume is limited by the ***VTmax*** setting in order to protect the patient from excessive tidal volumes in case of sudden leakages or incorrectly set PPS. If ***VTmax*** is reached, the breath is stopped and an expiration is started.
Babylog VN500 displays the ***VT limited*** alarm message. If leakage compensation is activated, the leakage-compensated tidal volume is used. If leakage compensation is deactivated, the tidal volume measured on the inspiratory side is used. The start-up value for ***VTmax*** corresponds to 130 % of the preconfigured tidal volume.

The pressure support is terminated as soon as the inspiratory flow falls below 15 % of the maximum inspiratory flow.

The pressure support is also terminated as soon as the duration of the support has reached the maximum inspiratory time. For intubated patients, the maximum inspiratory time in the ***Ped. pat.*** patient category is limited to 1.5 seconds. For the ***Neo.*** patient category, the maximum inspiratory time can be set with ***Timax*** to a maximum of 1.5 seconds. In the case of non-invasive ventilation, the maximum duration of support for the ***Ped. pat.*** patient category can be set with ***Timax***.

In the ***Neo.*** patient category, this mode is not available with non-invasive ventilation.

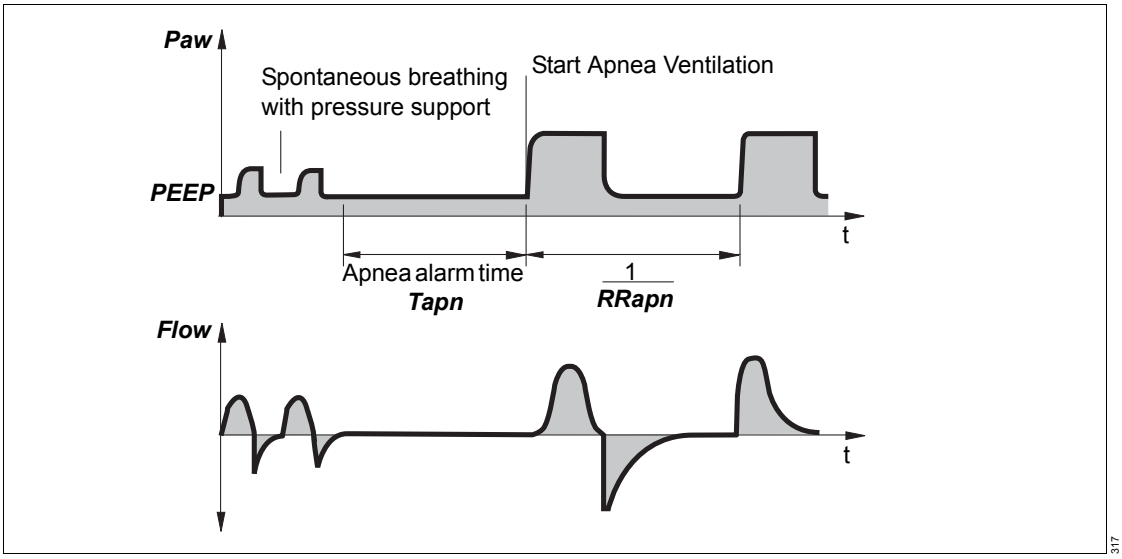
If *Paw high* is linked to the *Pmax* therapy control, set the maximum pressure that can be applied with the *Pmax* setting!

If *Paw high* is not linked to the *Pmax* therapy control, always set the *Paw high* alarm limit so that Babylog VN500 generates an alarm in the event of an increase in airway pressure due to compliance. The maximum pressure that can be applied is limited to 5 mbar (5 cmH_2O) below the upper alarm limit.

Additional settings for ventilation

Apnea Ventilation

For switching over automatically to volume-guaranteed mandatory ventilation in case of apnea.



For Babylog VN500 to be able to detect an apnea, flow measurement with the neonatal flow sensor must function and flow monitoring with the neonatal flow sensor must be activated.

Babylog VN500 detects an apnea when no expiratory flow is measured or insufficient inspiratory gas is delivered during the set apnea alarm time ***Tapn***. If apnea ventilation is activated, the device starts volume-guaranteed ventilation with the ventilation parameters ***RRapn*** and ***VTapn***. The inspiratory time for apnea ventilation is determined from the set apnea respiratory rate ***RRapn*** and a fixed I:E ratio of 1:2.

The patient can breathe spontaneously and the mandatory breaths are synchronized with the patient's spontaneous breathing. The apnea ventilation respiratory rate ***RRapn*** remains constant. Babylog VN500 provides synchronized intermittent mandatory ventilation.

Apnea ventilation is terminated by touching the ***Apn. Vent. reset*** button. Babylog VN500 continues ventilating in the previously set ventilation mode. Changing the ventilation mode or the additional settings, e.g. ***PS***, also terminates apnea ventilation.

If an apnea situation generating an alarm occurs again during apnea ventilation, this indicates that the apnea ventilation respiratory rate ***RRapn*** has been set too low in relation to apnea alarm time ***Tapn***.

Automatic return from apnea ventilation

If the ***Automatic return from Apnea Ventilation*** function is configured, then the device automatically switches to the previous ventilation mode when sufficient spontaneous breathing is resumed. The following conditions must be met:

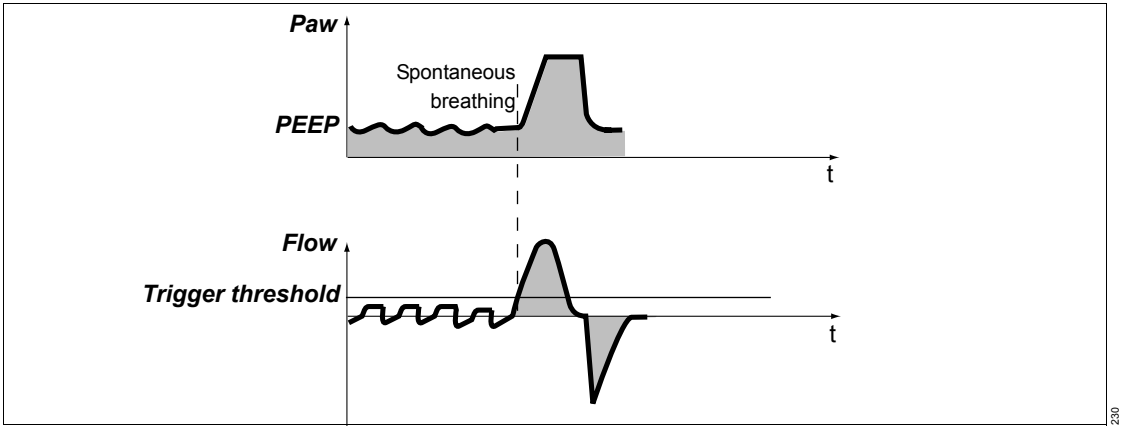
– Apnea ventilation must have been active for at least 2 minutes.
– The alarm message ***MV low*** is not active.
– One of the following conditions must additionally be met:
  – The ratio of MVespon to MVe is greater than 25 % and the ratio of MVleak to MVe is less than 40 %.
    Or
  – 80 % of the mandatory breaths are triggered spontaneously.

If apnea reoccurs within 3 minutes following automatic termination of apnea ventilation in the ***Ped. pat.*** patient category, the ***Automatic return from Apnea Ventilation*** function is disabled until apnea ventilation is terminated manually or another ventilation mode is selected.

For configuration of the ***Automatic return from Apnea Ventilation*** function, see "Configuring general settings" on page 154.

Flow trigger

The flow trigger is used to synchronize mandatory or pressure-supported breaths with spontaneous breathing. The flow trigger is also used to trigger breaths with SPN-CPAP/PS and SPN-CPAP/VS.

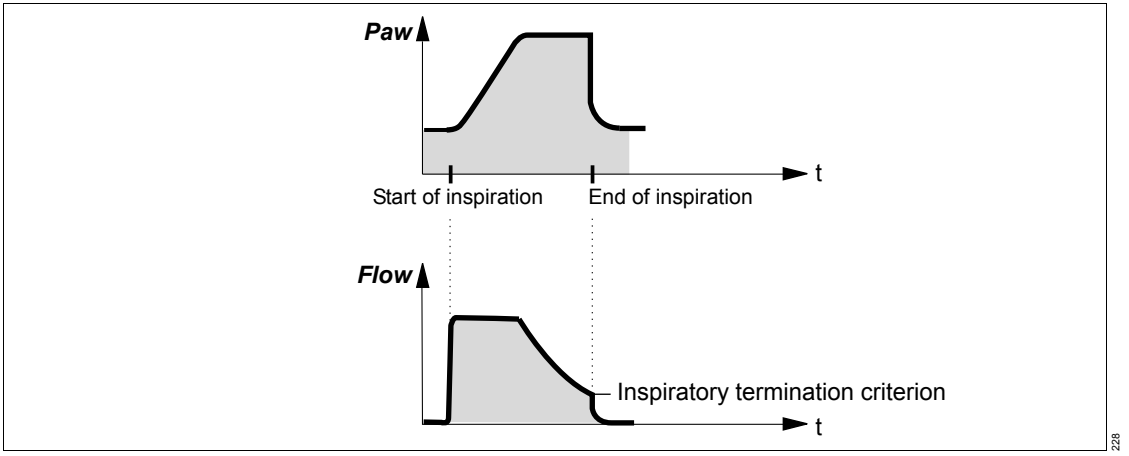


With the ***Flow trigger*** threshold, the mandatory breaths are synchronized with the inspiratory efforts. The start setting of the flow trigger can be configured on the page ***System setup > Ventilation > Start settings > VT, RR, Trigger***.

Spontaneous breathing activity by the patient is indicated on the screen by the brief appearance of the symbol.

The flow trigger is automatically leakage compensated.

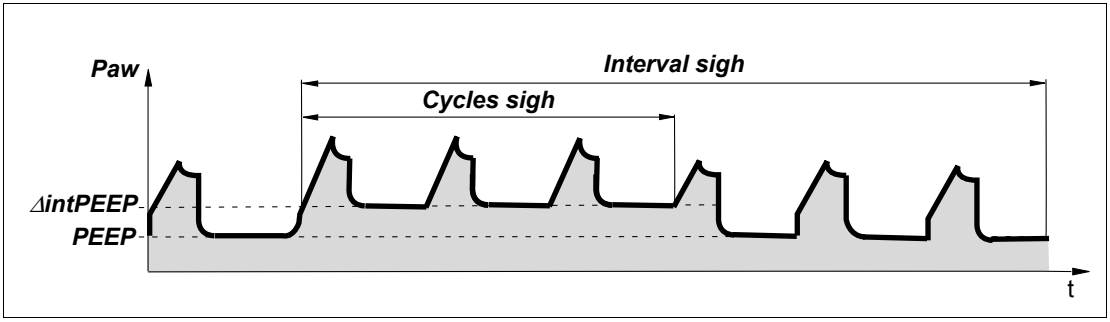
Inspiratory termination



For spontaneous breaths supported with ***PS***, ***VS*** and PPS, the length of inspiration is determined by the inspiratory termination criterion. Inspiratory termination specifies at which percentage of the peak inspiratory flow expiration is to start.

This value is set at 15 % by default and is automatically leakage compensated.

Sigh



Atelectasis can be prevented by activating the sigh function and setting the sigh in the form of an intermittent PEEP. The purpose of expiratory sigh is to open collapsed areas of the lung or to keep open "more dependent" areas of the lung.

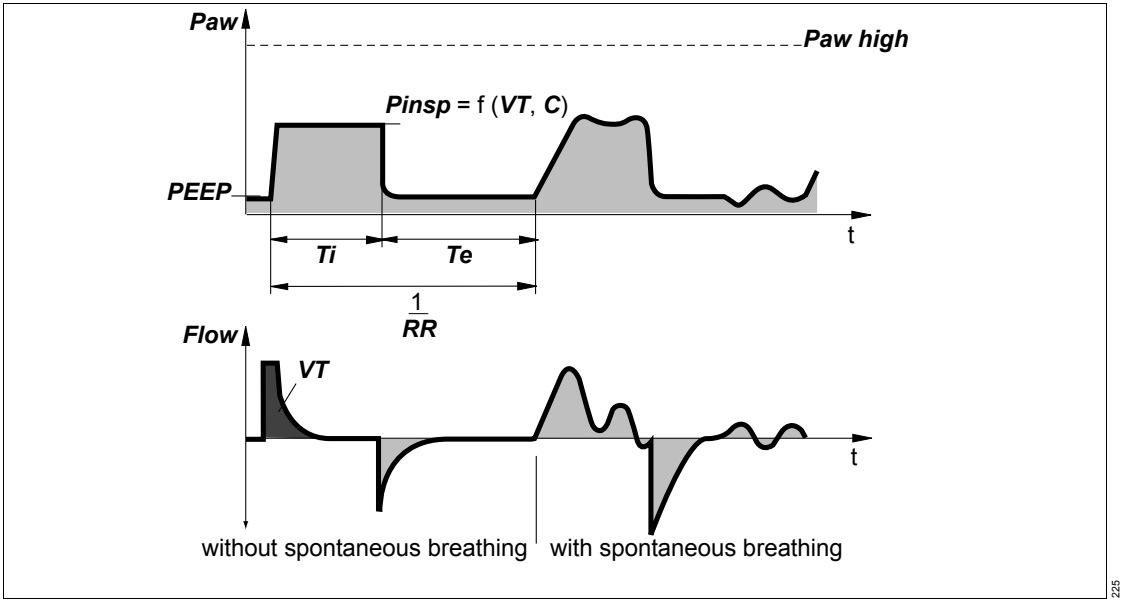
The sigh function can be activated in all ventilation modes with mandatory breaths, except for PC-APRV. When the sigh function is activated, the end-expiratory pressure PEEP increases by the set value of the intermittent PEEP.

The time between the two sigh phases can be set with the therapy control ***Interval sigh***.

The therapy control ***Cycles sigh*** controls how many respiratory cycles are covered by the sigh phase. The average airway pressure is higher, and a longer filling time is normally available.

In pressure-controlled ventilation, the inspiratory pressures ***Pinsp***, ***Psupp*** increase by the amount ***ΔintPEEP***.

Volume Guarantee



With the ***Volume Guarantee*** additional setting, the mandatory breaths are volume controlled. To apply the set tidal volume, Babylog VN500 controls the inspiratory plateau pressure ***Pinsp***.

Changes in lung conditions (compliance, resistance) are compensated. The tidal volume of the mandatory breaths remains constant.

Volume Guarantee can be switched on in the PC-SIMV, PC-CMV, PC-AC and PC-PSV ventilation modes. In the PC-MMV and SPN-CPAP/VS ventilation modes, volume guarantee is always available.

The advantage in contrast to time-cycled, pressure-limited ventilation, is that changes in lung conditions (compliance, resistance) have no impact on the tidal volume. If, for example, compliance increases, the inspiratory pressure decreases automatically. If, for instance, compliance decreases, then pressure rises but only up to the set pressure limit ***Pmax***.

If ***Pmax*** is not linked to the alarm limit ***Paw high***, Babylog VN500 increases ***Pinsp*** up to a maximum of 5 mbar (5 cmH_2O) below the set alarm limit ***Paw high***.

Fluctuations in spontaneous breathing are also compensated. The greater the patient's inspiratory efforts are, the lower the pressure Babylog VN500 applies. Thus with Volume Guarantee, Babylog VN500 always ventilates with just the right pressure required for the tidal volume desired. The pressure load on the lungs is limited to the extent absolutely necessary.

Without Volume Guarantee, the user must adjust the inspiratory pressure to reach the tidal volume desired.

The control works in the range ***PEEP*** + 0.1 mbar (0.1 cmH_2O) to ***Pmax*** (or ***Paw high*** – 5 mbar (5 cmH_2O)) for spontaneous breaths. For triggered mandatory breaths, the control works in the range ***PEEP*** + 5 mbar (5 cmH_2O) to ***Pmax*** (or ***Paw high*** – 5 mbar (5 cmH_2O)). Using the setting for ***Pmax*** or the alarm limit ***Paw high*** – 5 mbar (5 cmH_2O), the user limits the maximum pressure of the device.

The set tidal volume cannot be applied under these conditions:
– ***Pmax*** is insufficient
– The inspiratory pressure pattern has no plateau because the flow is too low or the inspiratory time ***Ti*** is too short.

A set inspiratory time ***Ti*** shorter than the lung filling time can be recognized from the flow curve. The flow at the end of the inspiratory time has not dropped to zero. In this case, it must be decided whether the current condition of the patient permits prolongation of the inspiratory time ***Ti*** in order to reduce peak pressure even further. This effect can also be caused during ventilation, e.g., due to a build-up of secretion. In this situation, the pressure is limited by Babylog VN500 as described.

If the tidal volume measured is below 90 % of the set tidal volume, Babylog VN500 generates an alarm.

The control occurs gradually from breath to breath. The tidal volume is measured, then compared to the set tidal volume and a new plateau pressure is calculated for the next breath. After a change to the set tidal volume, the inspiratory pressure required for this is reached after just a few breaths.

In the ***Neo.*** patient category, the tidal volume measured on the expiratory side is taken as a basis for the control. In the ***Ped. pat.*** patient category, the inspiratory tidal volume is used. If leakage compensation is activated, the leakage-compensated tidal volume is used for the control.

The minimum inspiratory pressure for mandatory non-triggered breaths is 5 mbar (5 cmH_2O) above PEEP; for triggered mandatory and pressure-supported spontaneous breaths it is 0.1 mbar (0.1 cmH_2O) above PEEP.

In case of major tube leakage, the actual tidal volume in the patient's lungs can (as in other ventilation modes also) be larger than the tidal volume measured on the expiratory side. Then the inspiratory and expiratory tidal volumes are different.

If, in the course of an inspiration, the delivered and measured ***VT*** exceeds the set ***VT*** by an amount dependent on the actual leakage rate, Babylog VN500 terminates the inspiration and starts the expiration.

If the flow sensor fails, ventilation is continued with the pressure used last and Babylog VN500 generates an alarm.

Set the alarm limits ***MV high*** and ***MV low*** appropriately in order to avoid excessive or insufficient flow following rapid changes in compliance. When using Volume Guarantee, activate flow monitoring!

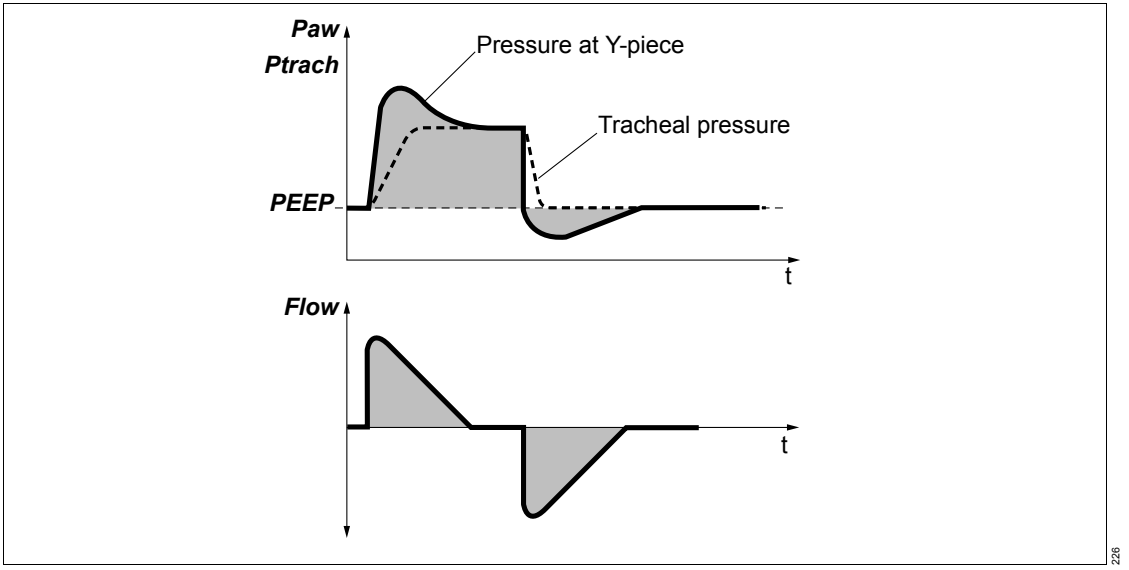
Start-up procedure with volume guarantee

On switching on the Volume Guarantee function, Babylog VN500 applies the set tidal volume ***VT*** by delivering a pressure-controlled breath with an inspiratory pressure of 5 mbar (5 cmH_2O) above the set PEEP. Babylog VN500 measures the applied volume in this case and calculates an initial target pressure for the set volume. The next mandatory breath is applied with an inspiratory pressure that corresponds to 75 % of this target pressure. Babylog VN500 measures the applied volume again here and calculates a new target pressure for the set volume. The next mandatory breath is applied with this target pressure. As described above, the following mandatory breaths are changed in the inspiratory pressure so that the set volume is reached on average.

ATC

Automatic Tube Compensation

Compensation of the tube resistance



ATC controls the airway pressure at the tracheal level. This function calculates and displays the tracheal pressure on the basis of a mathematical tube model, the set tube type and the inner diameter of the tube.

When tube compensation is activated, Babylog VN500 displays the calculated tracheal pressure in the pressure curve together with the pressure at the Y-piece as a line. Activated tube compensation is indicated by ***ATC*** and the tube diameter in the page header bar.
When selecting loops, tracheal pressure can also be selected as a parameter. Tracheal pressure can also be displayed when tube compensation is deactivated, if the calculation of the tracheal pressure was activated on the page ***Start/Standby > Tube/NIV*** and the tube type and diameter were entered. Babylog VN500 uses this value for calculating leakage and determining the lung mechanics, but not for tube compensation. The selected degree of compensation is not considered when displaying tracheal pressure or when determining leakage and lung mechanics.

Calculating tracheal pressure

Babylog VN500 calculates tracheal pressure on the basis of a square function of tube resistance and patient flow.

$P_{Trachea} = Paw - K_{Tube} \times Flow^2$

$P_{Trachea}$:	Pressure in the trachea
Paw:	Pressure at the Y-piece of the breathing circuit
K_{Tube}:	Tube coefficient (see table on page 266)
Flow:	Patient flow
	Inspiration: Flow >0
	Expiration: Flow <0

The selected tube type and the inner diameter of the tube must correspond with the real tube for correct calculation and display of the tracheal pressure. This is required for correct tube compensation.

When tube compensation is activated, the ventilation pressure in the breathing circuit is increased during inspiration or decreased during expiration. The airway pressure is adjusted to the tracheal level if 100 % compensation of the tube resistance has been selected.

Expiratory tube compensation can be deactivated.

For the mandatory portion of the breath, the inspiratory tube compensation can be deactivated.

When tube compensation is activated, Babylog VN500 controls the ventilation pressure so that the resistive work of breathing on the tube is compensated in accordance with the selected degree of compensation.

Depending on the direction of the patient flow, the airway pressure is increased during inspiration or decreased during expiration.

The airway pressure can be reduced to a minimum of 0 mbar (0 cmH_2O).

The maximum value for the airway pressure can be set using the ***Pmax*** therapy control. If ***Pmax*** is not linked to the alarm limit ***Paw high***, the maximum pressure is limited to 5 mbar (5 cmH_2O) below the alarm limit ***Paw high***. The pressure limitation message is displayed when the maximum permitted values are reached.

If the value selected for ***Paw high*** or ***Pmax*** is too low, it may impair the effectiveness of tube compensation. If the value selected for ***Paw high*** or ***Pmax*** is too high, it may result in unwanted high airway pressures. When setting ***Pmax***, be aware that this value may actually be reached in contrast to the value for ***Paw high***.

Calculating the support

The level of support ΔPaw applied during ATC is calculated on the basis of a square law function of tube resistance and patient flow.

ΔPaw = Comp. x K_{Tube} x $Flow^2$

Comp.: Degree of compensation 0 to 100 %

K_{Tube}: Tube coefficient (see table on page 266)

Flow: Patient flow

Tube coefficient

The tube coefficient K_{Tube} is largely determined on the basis of the results obtained by Guttmann et al*.

The tube coefficient K_{Tube} for the full-length tube is always taken as the basis. The effect of the shortened length is negligible.

The values for the tube coefficients are shown in the following tables.

* Literature reference [5], see page 282

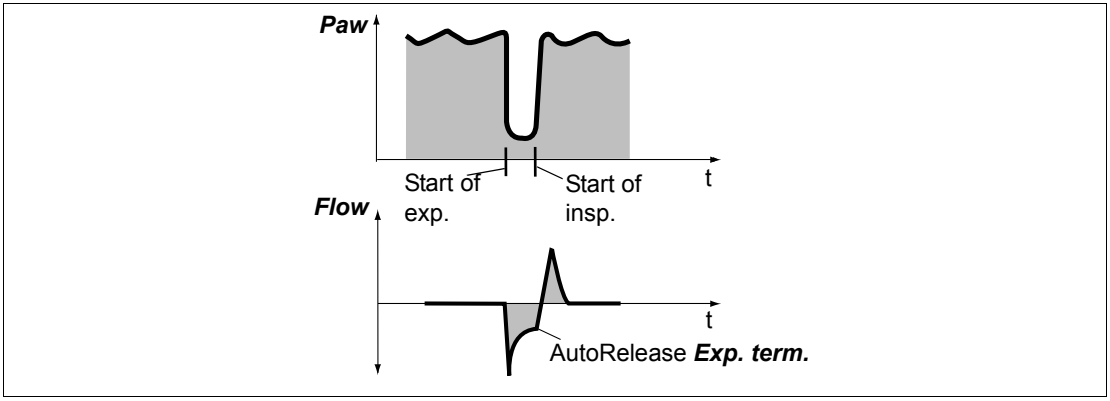
Table for endotracheal tube:

Inner diameter of the tube (mm)	Tube coefficient K_{Tube} (mbar/L^2/s^2)
2.00	1834.00
2.50	600.00
3.00	340.00
3.50	170.00
4.00	100.00
4.50	50.00
5.00	30.96
5.50	23.70
6.00	17.21
6.50	13.05
7.00	10.56
7.50	8.41
8.00	6.57

Table for tracheostomy tube:

Inner diameter of the tube (mm)	Tube coefficient K_{Tube} (mbar/L^2/s^2)
2.50	600.00
3.00	340.00
3.50	170.00
4.00	100.00
4.50	50.00
5.00	30.96
5.50	15.40
6.00	10.00
6.50	7.90
7.00	6.38
7.50	5.20
8.00	4.50

AutoRelease



In ventilation mode PC-APRV, the duration of pressure release is determined from the expiratory flow curve when ***AutoRelease*** is activated. The ***Exp. term.*** setting specifies when the ventilation returns to the pressure level ***Phigh*** dependent on the decline in percent of the peak expiratory flow. The therapy control ***Tlow max*** limits the maximum duration of pressure release.

When ***AutoRelease*** is switched on, the change-over from the upper pressure level ***Phigh*** to the lower pressure level ***Plow*** is synchronized with the patient's spontaneous breathing.

Synchronization of the mandatory breath reduces the effective time of the upper pressure level. Babylog VN500 prolongs the subsequent ventilation time on the upper pressure level by the missing time.

Special maneuvers

Medication nebulization

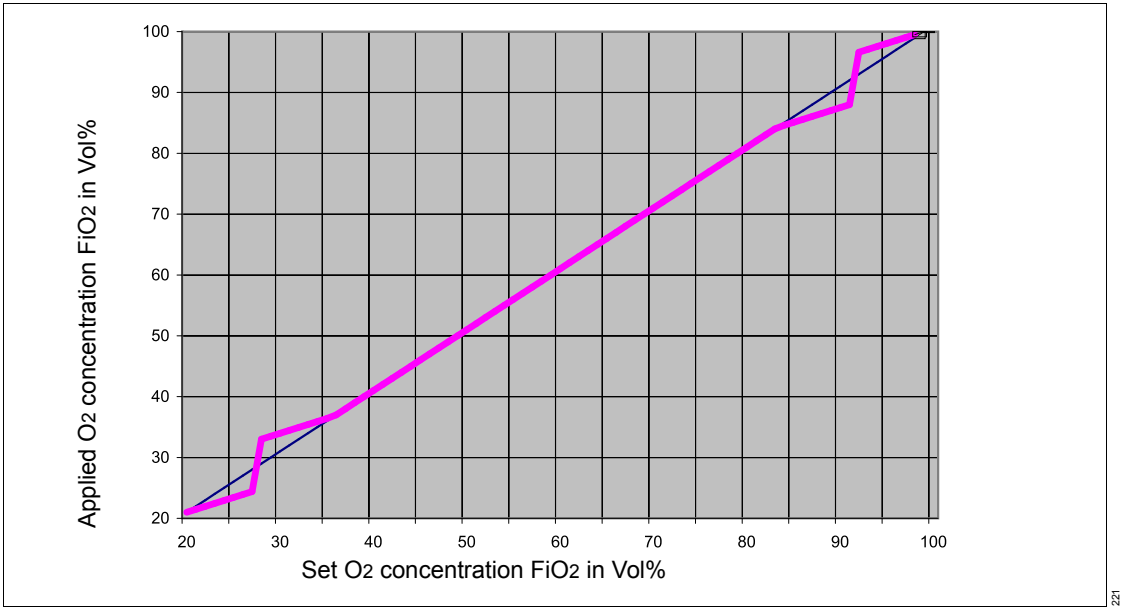
Insp. O_2 concentration during medication nebulization

Only use medication nebulizer 8411030. If other medication nebulizers are used, considerable deviations may occur in the tidal volume and the inspiratory O_2 concentration!

To minimize the deviation from the set O_2 concentration, Babylog VN500 uses a gas mixture to drive the medication nebulizer. The gas mixture is generated by switching over between compressed air and O_2 in short time intervals.

The medication nebulizer nebulizes continuously. The aerosol generated during expiration does not reach the lungs, however. The medication nebulizer is supplied with compressed air, O_2 or a mixture of compressed air and O_2 by Babylog VN500, depending on the set O_2 concentration.

The graph shows the possible deviations of the applied O_2 concentration from the set FiO_2 concentration with respiratory rates above 12/min.



In the case of Air supply from the gas supply unit GS500

If Babylog VN500 is supplied with Air from the gas supply unit GS500 and O_2 is supplied from the central gas supply system, the medication nebulizer operates with O_2 only. The measured value ***FiO_2*** indicates the O_2 concentration of the gas supplied at the inspiratory port and not the O_2 concentration administered to the patient. Deviations up to ±18 Vol% are possible.

C20/C

The C20/C index is a calculation of the compliance of the last 20 % (C20) of a breath in relation to the compliance (C) of the entire breath.

During a breath, Babylog VN500 determines continuously the pressure applied and the resulting tidal volume. The compliance of the last 20 % of a breath determined in this manner is set in proportion to the total compliance.

From the ratio determined, the following information can be derived:

– C20/C <1: A decrease of compliance at the end of the breath was detected. The lungs may be overinflated.

– C20/C >1: An increase of compliance at the end of the breath was detected. Tidal recruitment may be occurring.

– C20/C = 1: No change in compliance at the end of a breath could be detected. The lungs may not be overinflated, or tidal recruitment may not be occurring.

The calculation of C20/C takes into account the effect of the resistance of the endotracheal tube used or the tracheostomy tube used. For this, the tube diameter is required. The correct tube diameter entry of the tube used determines the quality of the C20/C index calculated.

The C20/C index is always displayed as long as a correction delivers plausible results with regard to the resistance. If, for instance, a smaller tube diameter was entered than that of the tube actually used, a correction to the measured values may deliver an implausible result. In this case, no C20/C index is displayed. The parameter field remains empty.

Smart Pulmonary View

Graphic display of lung characteristics

Smart Pulmonary View is a graphic display of lung flexibility (compliance) and resistance of the airways (resistance).

The representation corresponds to the displayed measured values of the respective patient.

The display range of compliance is 0 to 400 mL/mbar (400 mL/cmH_2O).

The display range of resistance is 0 to 300 mbar/L/s (300 cmH_2O/L/s).

To detect an improvement or deterioration of the patient's condition with regard to compliance and resistance, it is possible to adapt the representation to the current values of the patient. One measuring range starts at 0 and goes to double the value of the current compliance; the other measuring range starts at 0 and goes to double the value of the current resistance. After the adaptation, the measuring values determined are displayed as reference values with the time and date. In the graph, the current values (calibration values) are displayed as an orange broken line. The scales for compliance and resistance are adapted.

The compliance and resistance measured respectively are displayed by thin or thick lines accordingly.

The point when the maximum value that is based on the last calibration is reached is represented with a red line as a boundary. This indicates that the measured values determined can no longer be represented graphically. The measured values are outside the display range. Babylog VN500 displays a request for a new calibration.

The diaphragm is displayed schematically underneath the representation of the lung. The movement of the diaphragm indicates synchronized mandatory breaths, supported (triggered) breaths, or spontaneous breaths.

The ratio between spontaneous breathing and mandatory ventilation is displayed in a diagram:

– ***RRspon*** and ***VTspon*** represent the spontaneous minute volume as an area,

– ***RRmand*** and ***VTmand*** represent the mandatory minute volume as an area.

The display is a qualitative representation of the respective minute volume.

From this, the following information can be derived:

– The ratio between the spontaneous and mandatory minute volumes

– The quality and pattern of the spontaneous breathing, e.g. Rapid Shallow Breathing

Smart Pulmonary View is a qualitative representation of the ventilation situation. Local pathophysiological peculiarities, such as atelectasis or airway obstructions of the lungs, cannot be displayed.

Furthermore, individual patient situations cannot be displayed, such as the condition after a pneumectomy or a diaphragmatic hernia.

Description of the therapy types

O_2 Therapy

The O_2 Therapy function can be used for patients with independent breathing. The continuous flow is applied via an oxygen mask, a hood, or nasal cannula. The O_2 concentration and the flow can be adjusted.

NIV – Non-invasive ventilation

Non-invasive ventilation by prongs or mask for patients with spontaneous breathing

Leakages are greater with non-invasive ventilation than with invasive ventilation. Babylog VN500 takes into account the leakages in the ***NIV*** application mode accordingly.

The ***Tdisconnect*** setting can be used to delay the ***Airway pressure low*** alarm.

In the ***Neo.*** patient category, only the SPN-CPAP or PC-CMV ventilation modes may be selected. When using prongs or a mask, the neonatal flow sensor must be removed from the breathing circuit. Babylog VN500 switches off flow monitoring with the neonatal flow sensor.

Flow reduction *Anti Air Shower*

If a disconnection is detected, flow delivery is reduced until after reconnection.

Automatic leakage compensation

Mode of operation

Babylog VN500 determines the difference between the measured flow on the inspiratory side and the measured flow on the expiratory side. This difference provides a measure of the amount of leakage and is displayed by Babylog VN500 as the leakage minute volume ***MVleak*** and relatively as ***% leak*** (MVleak to MVi).

The calculation of leakage compensation takes into account the airway pressures. A higher percentage of volume is lost on the inspiratory side than on the expiratory side because the pressure during inspiration is higher. The displayed leakage minute volume ***MVleak*** is based on the mean pressure ***Pmean***. The leakage minute volume ***MVleak*** also takes the inspiratory leakages into account. Due to technical tolerances, a small leakage minute volume may be displayed even if the tube leakage is closed. If there is a rapid change in the leakage, e.g., due to the leak being opened or closed suddenly, Babylog VN500 needs a few breaths to identify the new leakage value. Babylog VN500 prevents any potential rises in pressure resulting from this.

The inspiratory flow trigger threshold and the inspiratory termination criterion are applied to the leakage-compensated flow, with both settings being continuously optimized with regards to the leakage. This automatic adjustment also takes place if leakage compensation is deactivated.

If leakage compensation is activated, the values measured for volume and flow as well as the curves for flow and volume are displayed with leakage correction, with the exception of the minute volume measured during expiration and all measured values which are explicitly marked as inspiratory or expiratory, such as ***VTi*** and ***VTe***.

Activating or deactivating leakage compensation on page ***System setup > Ventilation > General settings***.

Example of leakage compensation with flow trigger or inspiratory termination criterion

The mode of operation is illustrated using a simplified example with the following values:
– Flow trigger setting 0.2 L/min
– Leakage increases from 0 % to 20 %

Mode of operation with leakage compensation: Babylog VN500 determines the leakage flow. The leakage flow is subtracted from the total flow in order to determine the patient flow. Only this flow is used for the flow trigger or the inspiratory termination criterion. After a few breaths Babylog VN500 "learns" the leakage and avoids auto-triggering. If the leakage is closed, the sensitivity of the flow trigger is automatically increased again. The same applies to the inspiratory termination criterion for breaths with pressure support or volume support.

Leakage rate

Babylog VN500 determines the mean leakage flow from the difference between inspiratory minute volume MVi and expiratory minute volume MVe (displayed as MV). Standardized as MVi, the result is the leakage rate displayed in percent:

Leakage rate = 100 % x (MVi – MVe) / MVi

Measurements

Measurement principles

Flow measurement with neonatal flow sensor

The flow is measured with a hot wire anemometer between the Y-piece and the tube. The flow direction is detected by the use of two hot wires, one of which is shielded on one side.

The amount of energy required to maintain the wire at a temperature of 400 °C (752 °F) is used as a measure of the flow passing through the sensor, cooling the hot wire in the process.

The lowest flow at which detection functions reliably is 0.2 L/min. Lower flow values are therefore suppressed and displayed as zero.

Two different sensor types are available:
– Y-sensor, integrated in the Y-piece
– ISO sensor to insert between Y-piece and tube connector

Both sensor types use the same sensor insert. Despite this, the sensor properties are not identical. The sensor type is set in the ***Sensors/Parameters > Neonatal flow sensor*** dialog window in order to adapt the measurement for this type of sensor optimally.

O_2 measurement

A heating and a temperature sensor are positioned in a homogeneous magnetic field which is periodically activated and deactivated. The thermal conductivity of O_2 changes due to the magnetic field. The change in thermal conductivity is a measure of the O_2 concentration.

CO_2 measurement

CO_2 is measured via a mainstream system based on absorption measurement.

A light source generates a spectrum. Two light detectors record the characteristic absorption spectrum and supply electrical signals that change with the CO_2 concentration.

These signals are then evaluated and displayed. Heating the CO_2 sensor probe prevents condensation.

Airway pressure measurement

Babylog VN500 measures the airway pressure indirectly by means of two internal pressure sensors. The sensors are installed in the inspiratory and expiratory lines, thereby eliminating the need for an external pressure measuring line between the Y-piece and the device. As long as one side is without flow, the measured value of the flowless pressure sensor corresponds to the airway pressure at the Y-piece.

During ventilation, there is a constant basic flow. However, due to this constant basic flow, the zero-flow condition is never attained either on the inspiratory or expiratory side. The pressure measured by the inspiratory pressure sensor varies with the variations in airway pressure but is increased by the pressure drop in the inspiratory line of the breathing circuit. The pressure measured by the expiratory pressure sensor is reduced by the pressure drop in the expiratory line of the breathing circuit. These pressure differences are caused by the flow resistance of the breathing circuit.

During expiration, the value measured at the inspiratory pressure sensor (***Pinsp***) is reduced by the pressure drop caused by the basic flow ($Flow_{bf}$) in the inspiratory line of the breathing circuit (R_{insp}):

$Paw = Pinsp - R_{insp} \times Flow_{bf}$

Paw: Airway pressure at the Y-piece

Pinsp: Airway pressure at the inspiratory pressure sensor

R_{insp}: Flow resistance of the inspiratory breathing hose

$Flow_{bf}$: Basic flow

During inspiration, the value measured by the expiratory pressure sensor (P_{exp}) is raised relative to the airway pressure by the amount of the pressure drop caused by the flow (normally ($Flow_{out} \leq Flow_{bf}$) through the expiratory line of the breathing circuit (R_{exp}):

$Paw = P_{exp} + R_{exp} \times Flow_{out}$

Paw: Airway pressure at the Y-piece

P_{exp}: Airway pressure in expiratory breathing hose

R_{exp}: Flow resistance of the expiratory breathing hose

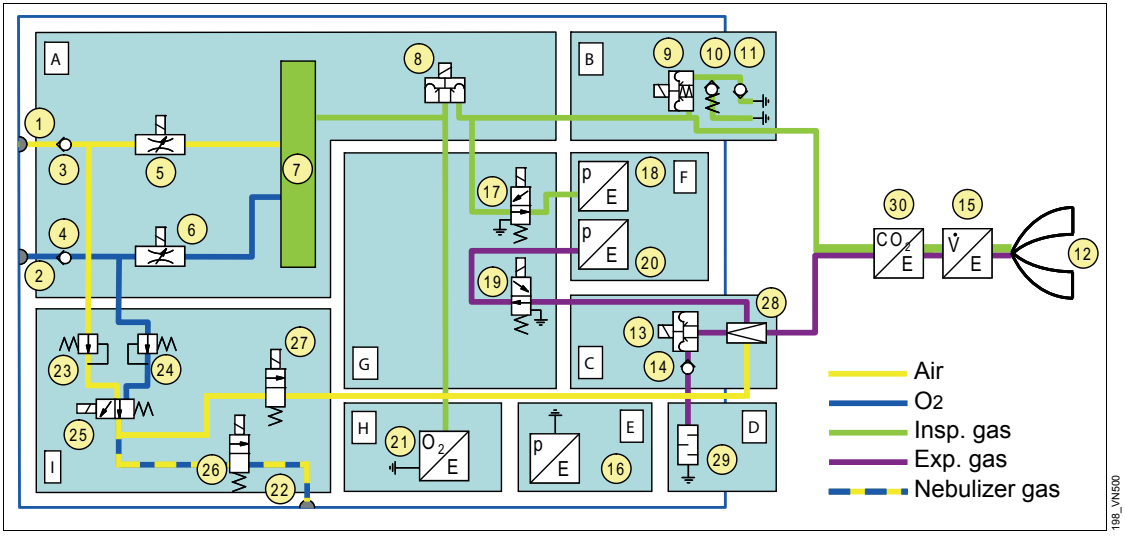
$Flow_{out}$: Flow through the expiratory valve during inspiration

The hose resistances are determined by Babylog VN500 during the breathing circuit check.

The user can configure whether the setting occurs via the pressure ramp ***Slope*** with a basic flow of 6 L/min or with an adjustable inspiratory flow ***Insp. flow*** and an expiratory basic flow of 6 L/min.

Pneumatic functional description

Pneumatic circuit diagram of Babylog VN500



1 Air gas inlet

2 O_2 gas inlet

3 Air non-return valve

4 O_2 non-return valve

5 Air metering valve

6 O_2 metering valve

7 Tank

8 Mixed gas metering valve

9 Safety valve

10 Emergency expiratory valve

11 Emergency breathing valve

12 Patient's lungs

13 Expiratory valve

14 Non-return valve

15 Neonatal flow sensor

16 Barometric pressure sensor

17 Calibration valve for inspiratory pressure sensor

18 Inspiratory pressure sensor

19 Calibration valve for expiratory pressure sensor

20 Expiratory pressure sensor

21 O_2 sensor

22 Nebulizer outlet

23 Air pressure regulator

24 O_2 pressure regulator

25 Nebulizer mixer valve

26 Nebulizer changeover valve

27 Ejector changeover valve

28 Ejector

29 Muffler

30 CO_2 sensor

A Gas mixture and gas metering assembly

B Inspiratory unit assembly

C Expiratory unit assembly

D Muffler

E Barometric pressure sensor

F Pressure measurement assembly

G Calibration assembly

H O_2 sensor

I Medication nebulization assembly/Ejector drive

Description of the pneumatic mode of operation

Babylog VN500 consists of 9 pneumatic assemblies.

The **gas mixture and dosage** assembly (A) delivers the time-variable flow of a gas mixture with adjustable proportions of O_2 and air. Gas from the (central) gas supply system enters the device via the gas inlet connections for O_2 and air (1, 2). Two non-return valves (3, 4) prevent one gas from returning to the supply line of the other gas. The mixing of the gases takes place in the tank (7) and is controlled via two control valves (5, 6). The supplied inspiratory flow is controlled via a third control valve (8).

The **inspiratory unit** assembly (B) consists of the safety valve (9) and two non-return valves (10, 11). In normal operation, the safety valve is closed so that the inspiratory flow is supplied to the patient (12) from the gas mixture and gas metering assembly. During other operating states, e.g., when Babylog VN500 is in standby, the safety valve is open and enables spontaneous inspiration through the emergency breathing valve (11). The emergency expiratory valve (10) provides a second channel for expiration when the expiratory valve (13) is blocked.

The **expiratory valve** assembly (C) consists of the expiratory valve (13) and a non-return valve (14). The expiratory valve is a proportional valve and is used to adjust the pressure in the breathing system.

In conjunction with the spring-loaded valve of the emergency air outlet (10), the non-return valve (14) prevents pendulum breathing during spontaneous breathing. The neonatal flow sensor (15) measures the inspiratory flow and expiratory flow in accordance with the hot-wire anemometry measurement principle. Therefore the measured flow is a mass flow (NTPD).

The ejector (28) generates a negative pressure at the expiratory valve (for future use). For this purpose, the ejector valve (27) supplies the driving gas (medication nebulization assembly/ejector drive (I)).

To reduce disruptive noises, the flow is passed behind the expiratory valve (13) via the muffler (D, 29) into the surrounding area.

The inspiratory unit, the expiratory valve, and the muffler assemblies can be detached from Babylog VN500 for cleaning purposes.

The mass flow to volume flow conversion (BTPS) requires knowledge of the ambient pressure. The ambient pressure is measured with the **barometric pressure sensor** (E, 16).

The pressure in the breathing system is measured with two independent pressure sensors (18, 20) that form the **pressure measurement** assembly (F). The pressure sensors are regularly zero calibrated. For this, the pressure sensors are connected to ambient pressure via the two calibration valves (17, 19). The calibration valves form the **calibration** assembly (G).

The **O_2 sensor** (H, 21) measures the inspiratory O_2 concentration based on a sidestream measurement principle. For calibration by the user during the device check, the O_2 sensor can be flushed with pure O_2 from the tank (7).

A pneumatic medication nebulizer can be connected to the nebulizer gas outlet (22) for medication nebulization. Babylog VN500 provides an intermittent gas flow consisting of O_2 and air to drive the medication nebulizer. This ensures that the deviation of the set O_2 concentration remains within the specified limits. For this, the gas from the two gas inlet connections (1, 2) is throttled by the pressure regulators (23, 24).

The intermittent gas delivery is done by nebulizer mixer valve (25). The nebulizer changeover valve (26) closes the nebulizer gas outlet when the nebulizer function is not switched on.

The nebulizer mixer valve, the nebulizer changeover valve, the ejector changeover valve, the nebulizer outlet and the two pressure regulators form the **medication nebulization/ejector drive** assembly (I).

The CO_2 concentration of the breathing gas can be measured using the CO_2 sensor (30). CO_2 is measured according to an optical measurement principle in the mainstream.

Babylog VN500 works at an elevated positive pressure of up to 10 bar (1000 kPa or 145 psi) without restrictions.

Main menu bar structure

The following table lists the buttons of the main menu bar with the resulting dialog windows of the same name and the tabs. Touching a tab opens the corresponding page. The dark gray buttons are always contained in the main menu bar. The white buttons are freely configurable and are assigned to the respective group. The freely configurable buttons open the corresponding page in the dialog window or activate a function.

Group symbol	Button in main menu bar	Horizontal tab	Vertical tab	Additional tabs
	**Alarms...**	Limits		
		Current alarms		
		Alarm history		
		Settings		
	Alarm volume			
	**Ventilation settings...**	Modes 1, 2, 3, 4		
			General settings	
			Additional settings	
				Overview
				Apnea Ventilation
				Trigger
				Sigh
				Volume Guarantee
				ATC
				Auto Release
		Mode 5		
			General settings	
			Additional settings	
				Overview
				Apnea Ventilation
				Trigger
				Sigh
				Volume Guarantee
				ATC
				Auto Release
		Other modes		
	Trigger			
	Apnea Ventilation			

continued next page

Group symbol	Button in main menu bar	Horizontal tab	Vertical tab	Additional tabs
	Views...			
	Day/Night			
	Freeze waveforms			
	Export screenshot			
	Main screen			
	Trends/Data...	Trends		
			Graphics 1	
			Graphics 2	
			Table	
		Values		
			Customized data	
			Values 1	
			Values 2	
			Settings	
		Logbook		
		Export data		
	Trends table			
	Values			
	Logbook			
	Customized data			
	Special maneuvers...	Maneuvers		
		Nebulization		
	Nebulization			
	O_2 suction			
	Man. insp./hold			
	Sensors/ Parameters...	Neonatal flow sensor		
		O_2 sensor		
		CO_2 sensor		
			Zero calib. on/off	
			Check sensor	
			Calibration	
	Neonatal flow sensor			
	O_2 sensor			
	CO_2 sensor			

continued next page

Group symbol	Button in main menu bar	Horizontal tab	Vertical tab	Additional tabs
	System setup...	Screen layout		
			Overview	
			General settings	
			Views	
			Customized data	
			Config. buttons	
			Trends graphic 1	
			Trends graphic 2	
			Therapy bar	
		Alarms		
			Overview	
			Preset limits	
			Alarm vol./tone	
		Ventilation		
			Overview	
			Patient category	
			Modes	
			Start settings	
				VT, RR, Trigger
				Pressures, O_2, I:E
				Other settings
				ATC
			General settings	
			Maneuver	
		Config. exchange		
		Applications		
		Exchange intervals		
		System		
			Overview	
			Country	
			Units	
			Interface	
				LAN
				COM
				External display
			Supply units	
				continued next page

Group symbol	Button in main menu bar	Horizontal tab	Vertical tab	Additional tabs
			Service	
				System Information
				Operating Data
				Options
				Service Call
	Applications			
	Help...			
⏻	**Start/ Standby...**			
		Start/Standby		
		Tube/NIV		
		Br. circuit/ Humidifier		
		System check	Overview	
			Device check	
			Breathing circ. check	
		Accessory status		

Factory-set screen views

View 1

Waveform Paw	FiO_2
	Pmean
Waveform Flow	MVe
	RR

View 2

Waveform Paw	FiO_2
	Pmean
Waveform Flow	MVe
	VT
Waveform Volume	Cdyn
	R

View 3

Waveform Paw	Cdyn
Loop Pressure Volume	C20/Cdyn
	R
	TC
	% leak

088_VN500

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Password for Babylog VN500 SW 2.n

Cut out from the Instructions for Use
Babylog VN500 SW 2.n

To prevent unauthorized adjustments, the following pages are password-protected:

4572

- ***System setup > Screen layout > Views***
- ***System setup > Alarms***
- ***System setup > Ventilation***
- ***System setup > Applications***
- ***System setup > Exchange intervals***

Information on the Password

To prevent unauthorized adjustments, the following pages in the ***System setup*** dialog window are password-protected:

- ***Screen layout > Views***
- ***Alarms***
- ***Ventilation***
- ***Applications***
- ***Exchange intervals***

The password appears on this page of the Instructions for Use. Cut out the area with the password and keep in a place which is safe from access by unauthorized persons.

If the area with the password has been removed, ask the person responsible for your device about making adjustments to the pages specified.

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These Instructions for use only apply to
Babylog VN500 SW 2.n
with the Serial No.:
If no Serial No. has been filled in by Dräger, these Instructions for use are provided for general information only and are not intended for use with any specific medical device.
These Instructions for use are provided for customer information only, and will not be updated or exchanged without customer request.

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