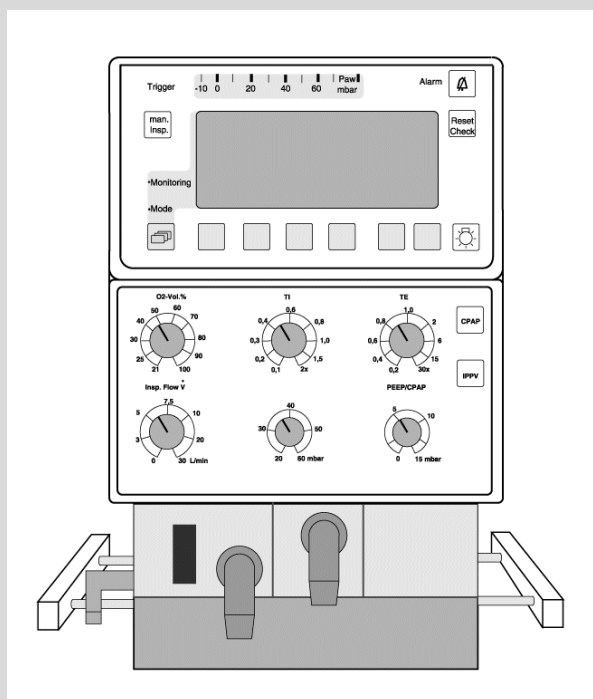


## Technical Service Manual

Babylog 8000/8000SC/8000 plus  
Intensive Care Ventilator



**Revision 10.0**  
**6173.3**  
**9029623**

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# Contents



# General



**1 Notes**

This Technical Documentation/Service Manual conforms to the International Standard IEC 60601-1.

Read each step in every procedure thoroughly before beginning any test. Always use the proper tools and specified test equipment. If you deviate from the instructions and/or recommendations in this Technical Documentation/Service Manual, the equipment may operate improperly or unsafely, or the equipment could be damaged.

Use only original Dräger parts and supplies.

The maintenance procedures described in this Technical Documentation/Service Manual may be performed by qualified service personnel only. These maintenance procedures do not replace inspections and servicing by Dräger Medical AG & Co. KGaA.



**Strictly follow the Instructions for Use/Operating Instructions! This Technical Documentation does not replace the Instructions for Use/Operating Instructions. Any use of the product requires full understanding and strict observation of the product-specific Instructions for Use/Operating Instructions.**



Unless otherwise stated, reference is made to laws, regulations or standards (as amended) applicable in the Federal Republic of Germany.

**1.1 Symbols and Definitions**



This symbol indicates a warning.



This symbol indicates tips and useful information.



This symbol is used to alert against unsafe practices when handling electrostatic sensitive devices (ESD).

Definitions according to German standard DIN 31051:

- Inspection = examination of actual condition
- Maintenance = measures to maintain specified condition
- Repair = measures to restore specified condition
- Servicing = inspection, maintenance, and repair



# Function Description



## 1 General

Babylog 8000/Babylog 8000 plus has a flow measurement function. The Babylog 8000 SC can be upgraded to a Babylog 8000 using the "flow measurement conversion kit."

### 1.1 Ventilation Modes

Babylog 8000/Babylog 8000 plus/8000 SC provides the following ventilation modes:

- IPPV (Intermittent Positive Pressure Ventilation), controlled and assisted constant-volume ventilation
- SIPPV (Synchronized Intermittent Positive Pressure Ventilation), synchronized controlled and assisted constant-volume ventilation
- IMV (Intermittent Mandatory Ventilation)
- SIMV (Synchronized Intermittent Mandatory Ventilation) weaning method for spontaneously breathing patients
- CPAP (Continuous Positive Airway Pressure) spontaneous breathing with positive airway pressure
- PSV (Pressure Support Ventilation) (optional as of software version 5.n)

### 1.2 Additional Functions

Babylog 8000/Babylog 8000 plus/8000 SC provides the following (optional) additional functions:

- High-frequency ventilation (HV) (as of software version 4.n)
- Volume guarantee (VG) (as of software version 5.n)

### 1.3 Monitoring

Babylog 8000/Babylog 8000 plus/8000 SC has integrated monitoring functions for:

- Fraction of inspired O<sub>2</sub> (FiO<sub>2</sub>)
- Airway pressure (Paw)
- Flow ( ) (Babylog 8000/Babylog 8000 plus)
- Minute volume (MV)
- Tidal volume (V<sub>T</sub>)

## 2 Block Diagrams

### 2.1 Block Diagram of the Components in Babylog 8000/Babylog 8000 SC with LC Display

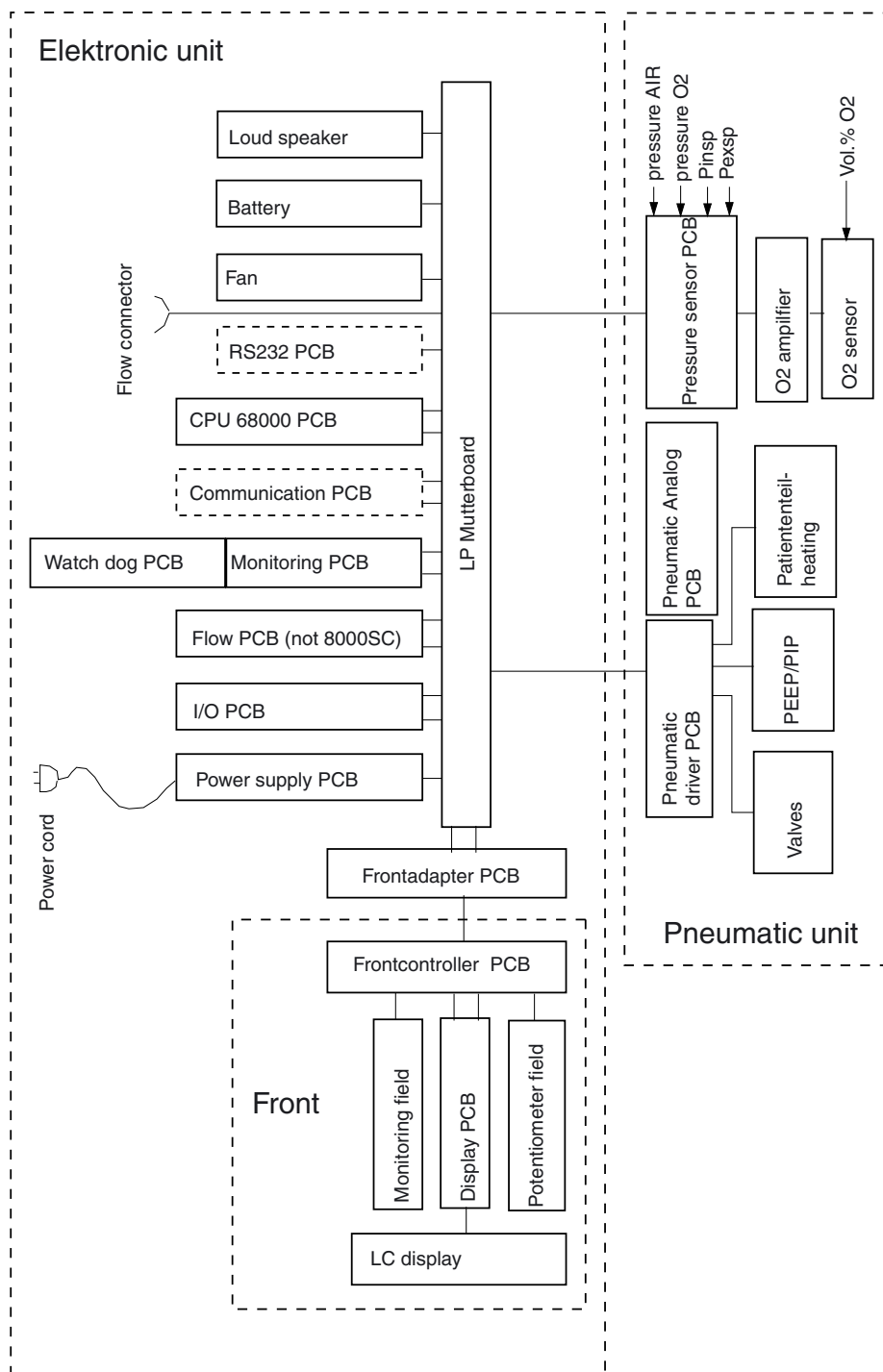
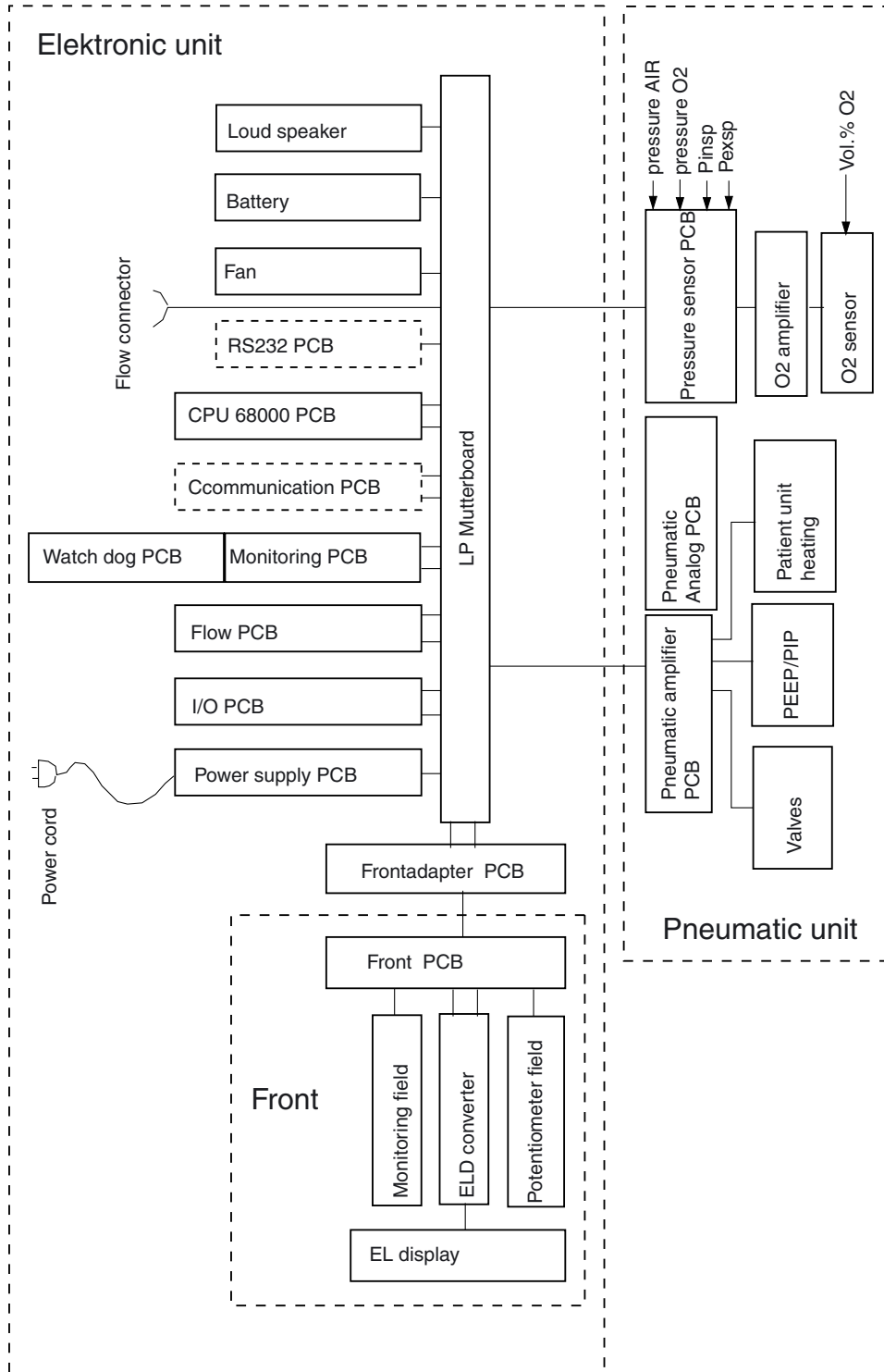


Fig. 1: Block diagram of the Babylog 8000/8000 SC with LC display



## 2.2 Block Diagram of the Components in Babylog 8000/Babylog 8000 plus with EL Display



**Fig. 2:** Block diagram of the Babylog 8000/Babylog 8000 plus with EL display

2.3 Block Diagram of the Babylog 8000/ Babylog 8000 plus/Babylog 8000 SC

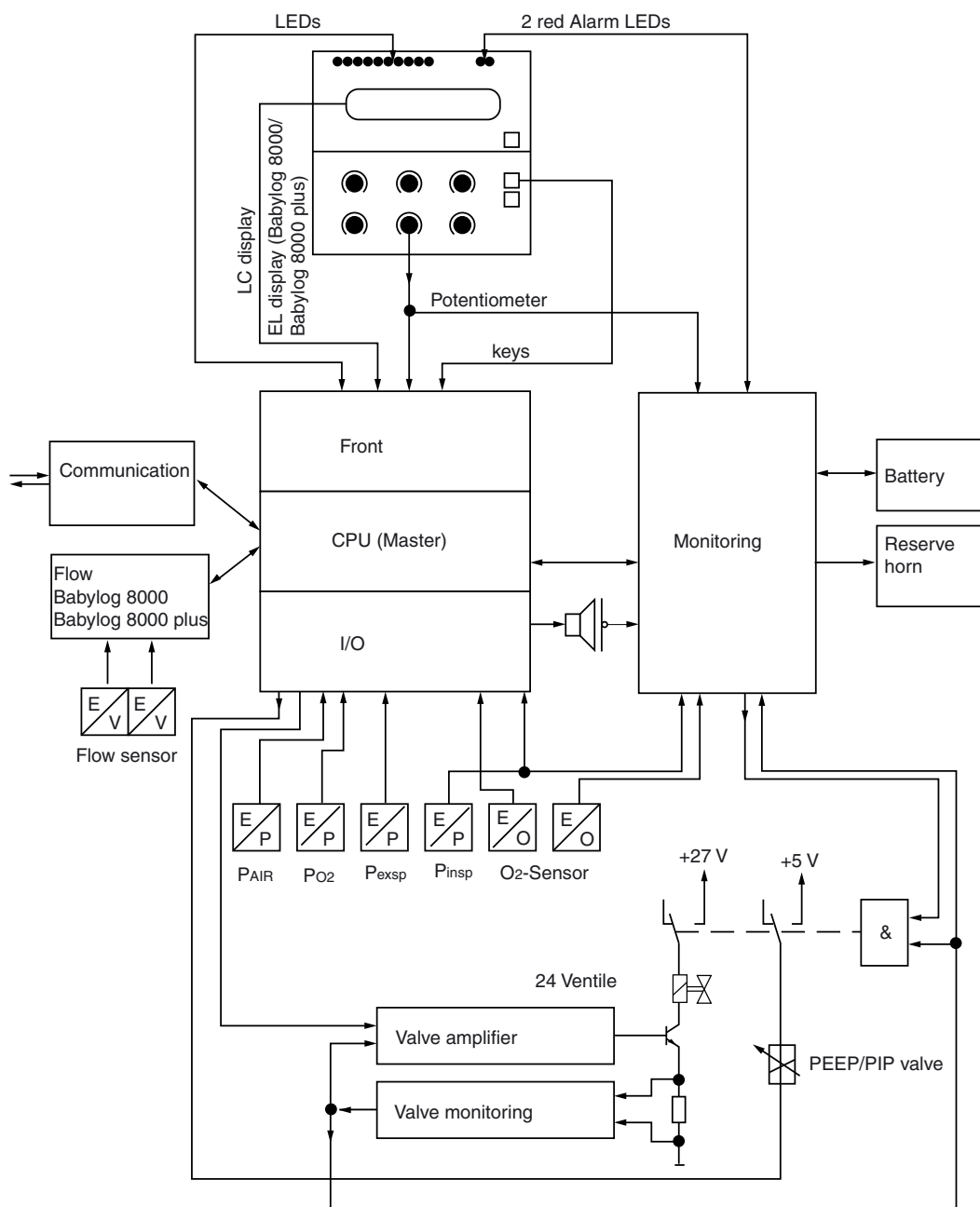


Fig. 3: Block Diagram of the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC

### 3 Airway Monitoring

In the ventilation modes IPPV/IMV and CPAP, the airway pressure (Paw), the flow at the Y-piece  $V_T$  (Babylog 8000/Babylog 8000 plus), and the fraction of inspired  $O_2$  ( $FiO_2$ ) are measured.

Depending on the selected mode and the menu settings, the parameters are monitored and displayed on the screen. Pressure and flow curves as well as their storage can be displayed graphically on the LC display or EL display. In all ventilation modes, the chronological sequence of the airway pressure (Paw) is displayed in the LED bargraph.

#### 3.1 Airway Pressure

Two internal pressure sensors measure the pressure at the inspiratory outlet (P<sub>insp</sub>) and the pressure at the expiratory inlet (P<sub>exp</sub>). The airway pressure is calculated as follows:

$$Paw = P_{insp} - 0.7 (P_{insp} - P_{exp})$$

The following pressures are calculated from the Paw pressure signal:

- Peak pressure (Peak)
- Mean airway pressure (P<sub>mean</sub>)
- Positive end-expiratory pressure (PEEP)

The peak pressure is the maximum positive pressure of the most recent respiratory cycle. After 30 s, at the latest, a new respiratory cycle must be recognized and a new measured value for the peak pressure must be generated, otherwise the current measured value is no longer valid and is removed from the display.

The mean airway pressure is the initial value of a software digital filter.

The PEEP is either the pressure value during the expiratory phase at a zero expiratory flow or the last measured value before the next inspiration. Like the peak pressure, the PEEP is no longer valid after 30 s and is removed from the display if a new measured value is not generated within the 30-s period.

#### 3.2 Trigger Signal

In order to generate a trigger signal, the inspiratory flow must be integrated during spontaneous breathing and compared to the adjustable trigger threshold.

#### 3.3 Measurement of the Fraction of Inspired $O_2$

A  $O_2$  sensor in the inspiration line measures the  $O_2$  content of the respiratory gas.

Calibration data of the  $O_2$  sensor is maintained after switching off the Babylog. If the Babylog has been out of operation for more than 24 hours, a calibration will automatically be carried out upon power-on.

The operator may also initiate a calibration manually, e.g. as required after replacing an  $O_2$  sensor.

A two-step calibration with 21% and 100% O<sub>2</sub> is always carried out in order to achieve a higher measurement accuracy over the whole concentration range and/or to be able to recognize a spent sensor cell.

The calibration procedure is described under section "[4 Monitoring Functions](#)".

If the O<sub>2</sub> measurement fails, the Babylog generates an alarm. This alarm status is shown in the status field of the screen by the flashing indication "FiO<sub>2</sub>".

### 3.4 Patient Flow (Babylog 8000/Babylog 8000 plus)

A direction-sensitive hot-wire flowmeter integrated into the Y-piece measures the inspiratory and expiratory flows through the tube. This measurement function must be reactivated each time after switching on Babylog 8000/Babylog 8000 plus and after each replacement of the sensor by calibrating the sensor. The flow signal is used to calculate the following values:

- Tidal volume (V<sub>T</sub>)
- Minute volume (MV)
- Percentage of the MV uptake through spontaneous breathing
- Tube leakage

The tidal volume is the expiratory flow signal applied between two breathing phase cycles.

Unlike the tidal volume, the minute volume is not related to a respiratory cycle. In the same way the inspiratory MV is calculated for leak rate detection. The expiratory minute volume is displayed. In addition to the complete minute volume, Babylog also calculates the expiratory minute volume uptake through spontaneous breathing.

Babylog calculates the percentage by comparing the total minute volume and the minute volume uptake through spontaneous breathing:

$$\text{spont.} = (\text{MV}_{\text{spontaneous}}/\text{MV}) * 100\%$$

The leakage at the tube can be estimated by comparing the inspiratory and the expiratory minute volume.

The leakage at the tube L is calculated as follows:

$$L = (\text{MV}_{\text{insp}} - \text{MV}_{\text{exp}})/(\text{MV}_{\text{insp}} + \text{MV}_{\text{exp}}) * 100.$$

The respiratory rate f is measured through the inspiratory respiratory phase cycles.

All measured values derived from the patient flow become valid only after successful calibration of the flow sensor.

If the flow sensor or the measuring electronics fails, an alarm is generated. However, Babylog can still be used without the functions depending on the flow measurement. This alarm status is shown in the status field of the screen by the flashing indication "flow".

## 4 Monitoring Functions

The system checks whether limit values are kept and all functions are ok. If a function fails or if the limit values are not met, Babylog will generate an alarm.

### 4.1 Fraction of inspired O<sub>2</sub> (FiO<sub>2</sub>)

#### 4.1.1 O<sub>2</sub> Measurement

The measured O<sub>2</sub> value is checked against upper and lower limit values. The alarm limits are automatically set at  $\pm 4$  vol.% below the set FiO<sub>2</sub> value. A time delay makes sure no alarm is activated when the set value (O<sub>2</sub>) is changed or when the O<sub>2</sub> sensor is calibrated.

The absolute sensor voltages are checked. The differential voltage between the two sensor cells must be lower than  $(U_1 + U_2)/8 + 1$  mV. The output voltage of each individual cell must be between 9.5 mV and 123.6 mV.

#### 4.1.2 O<sub>2</sub> Calibration

The O<sub>2</sub> sensor is either automatically calibrated 24 hours after the last calibration or manually after selection from the mode menu.

If the O<sub>2</sub> sensor is replaced during operation the new O<sub>2</sub> sensor will be calibrated automatically. However, Babylog cannot detect a sensor replacement if the unit is switched off. In this particular case, the operator has to calibrate the new O<sub>2</sub> sensor manually.

By switching over a valve the sensor is separated from the respiratory gas flow and purged with the calibration gas (O<sub>2</sub>). This leads to a change in concentration at the O<sub>2</sub> sensor. This change in concentration allows the Babylog to recognize the activation of the calibration valve.

The calibration valve is deactivated as soon as the calibration is completed.

A two-step calibration with 21% O<sub>2</sub> and 100% O<sub>2</sub> is carried out in order to achieve a higher measurement accuracy over the whole concentration range and to be able to recognize a spent sensor cell.

During the calibration procedure the microprocessor system processes (synchronizes) one of the two O<sub>2</sub> sensor channels. The O<sub>2</sub> channels are then submitted to a specific sequence of states controlled by one of the microprocessor systems and monitored for correct sequence and maximum period by the other. For instance, searching of the calibration values for 21% or 100% must not last longer than 3.5 minutes each.

The calibration value for 21% must be between 9.2 mV and 26 mV, and for 100% between 43.6 mV and 123.6 mV; this applies to both channels. The zero voltage resulting from both values must be between  $-6$  mV and  $+6$  mV.

After calibration is completed, the software checks whether the limit values respond correctly.

Calibration stops if a control gas fails.

## 4.2 Gas Supplies

The current measured values of the O<sub>2</sub> and AIR gas supplies are considered when the valve bank is adjusted. The inlet pressure for O<sub>2</sub> and AIR is 1.7 bar.

If the pressure falls below the limit value, a visible and audible alarm is generated. The operator is informed about the cause of the alarm by a plain text message on the display. If the adjusted O<sub>2</sub> concentration is 21% or 100%, only an advisory message (no alarm) is displayed if the non-added gas type fails.

If the pressure exceeds the limit value, the safety venting mechanism is activated and the continuous flow is switched off. The Babylog will continue to operate only when the pressure has decreased to a permissible level.

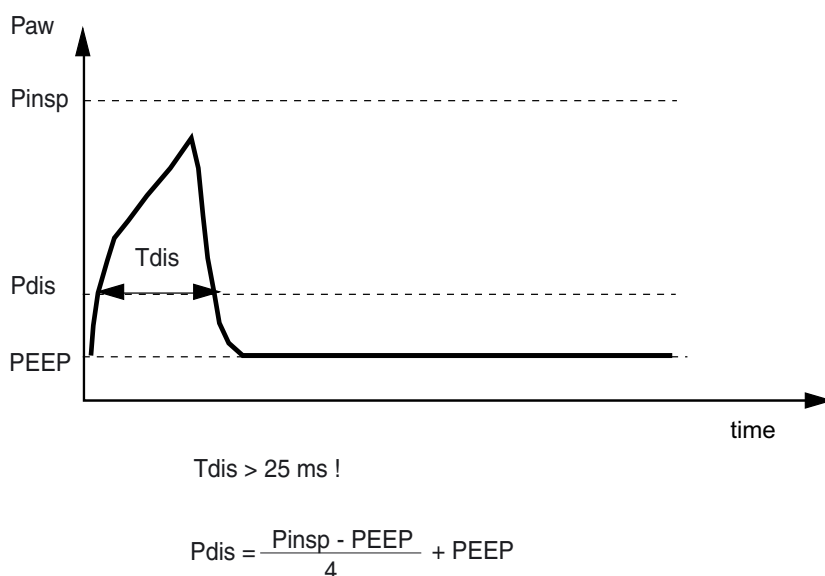
If the AIR supply fails, the Babylog control switches to O<sub>2</sub> supply. If the O<sub>2</sub> supply fails, Babylog switches to AIR supply.

## 4.3 Airway Pressure Monitoring

Depending on the selected mode and parameter settings, a certain airway pressure time profile is set. If the actual profile deviates from the set profile, the Babylog generates an alarm.

## 4.4 Disconnect Monitoring

Babylog recognizes whether or not the hose system has been connected correctly. If the hose system has been connected incorrectly, the continuous flow is (partly) directed to atmosphere. No pressure builds up in the hose system. Babylog checks during each breathing cycle whether a sufficiently high pressure is available during inspiration. Since inspiratory breaths occur in the mandatory ventilation modes IPPV/IMV, SIPPV and SIMV, this monitoring does not function in the CPAP mode.



**Fig. 4:** Disconnect Monitoring

During each mandatory breath, the level of the disconnection pressure ( $P_{dis}$ ) must be exceeded without interruption for at least the disconnection time ( $T_{dis}$ ), otherwise an alarm will be generated.  $P_{dis}$  is a function of the settings  $P_{insp}$  and PEEP. If  $P_{insp}$  is set considerably higher than the actually attained pressure, the  $P_{dis}$  alarm level likewise increases.

Depending on the flow and the inspiration time settings, the level might not be attained any more. Babylog 8000 generates an alarm even if there is no leakage in the breathing system.

### 4.5 Overpressure and Low Pressure Alarms

During the inspiratory and expiratory phases, the airway pressure ( $P_{aw}$ ) must not exceed the set pressure limit by more than 10 mbar. If the set pressure limit is exceeded by 10 mbar to 20 mbar, Babylog generates an alarm and, at the same time, reduces the inspiratory breath time. The remaining time is added to the CPAP phase. If the set pressure limit is exceeded by more than 20 mbar, an alarm is activated and the breathing system is vented.

In the CPAP phase, the airway pressure must be  $\pm 4$  mbar of the set PEEP/CPAP. Otherwise an alarm will be generated. If the limit is exceeded by more than 10 mbar, venting is carried out as during the inspiratory phase even if the pressure falls below the absolute level of  $-2$  mbar.

These overpressure and low pressure alarms apply to all ventilation modes.

#### 4.5.1 Babylog 8000 up to Software Version 3.0

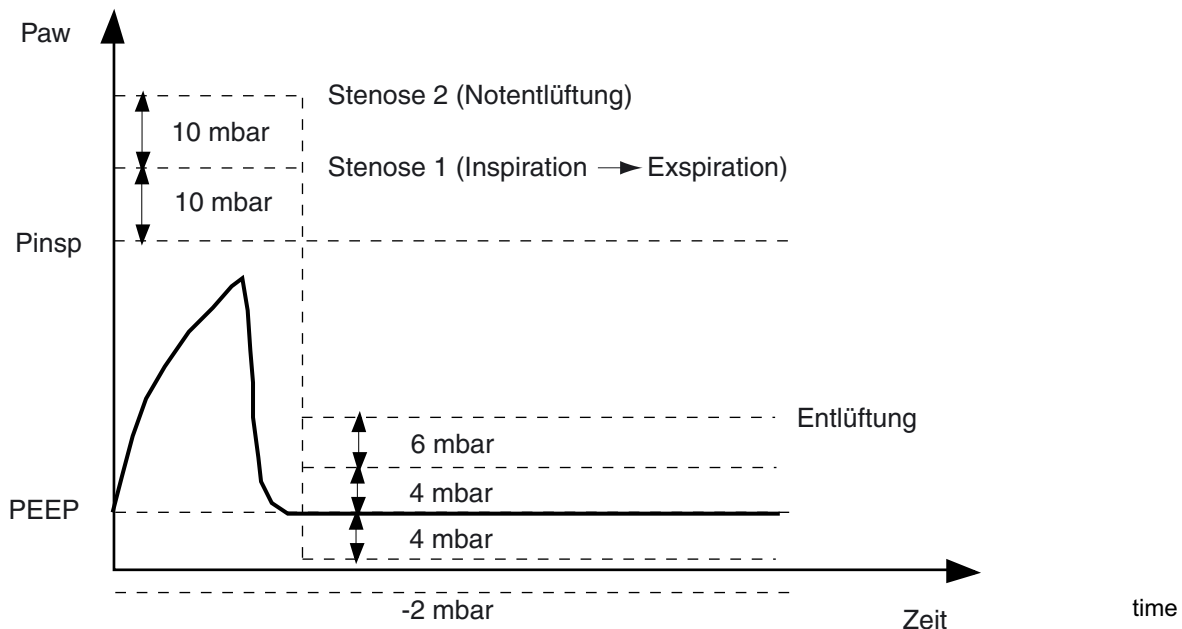


Fig. 5: Alarms

#### 4.5.2 Dynamic Stenosis Limit

The dynamic stenosis limit applies to Babylog 8000 units with software version 4.0 and Babylog 8000 SC

units with software version 1.0.

The limit value is (P<sub>insp</sub> + 5 mbar).

If this limit value is exceeded, the microprocessor system reads in the actual measured value at 8.3-ms intervals (sampling frequency). The limit value (P<sub>insp</sub> + 5 mbar) is subtracted from each of the actual measured values and entered in a summer.

As soon as the sum of 40 mbar (stenosis 1) is reached, Babylog switches over from inspiratory phase to expiratory phase. If a sum of 70 mbar is reached, despite of the safety measure (stenosis 1), the system will carry out an emergency venting.

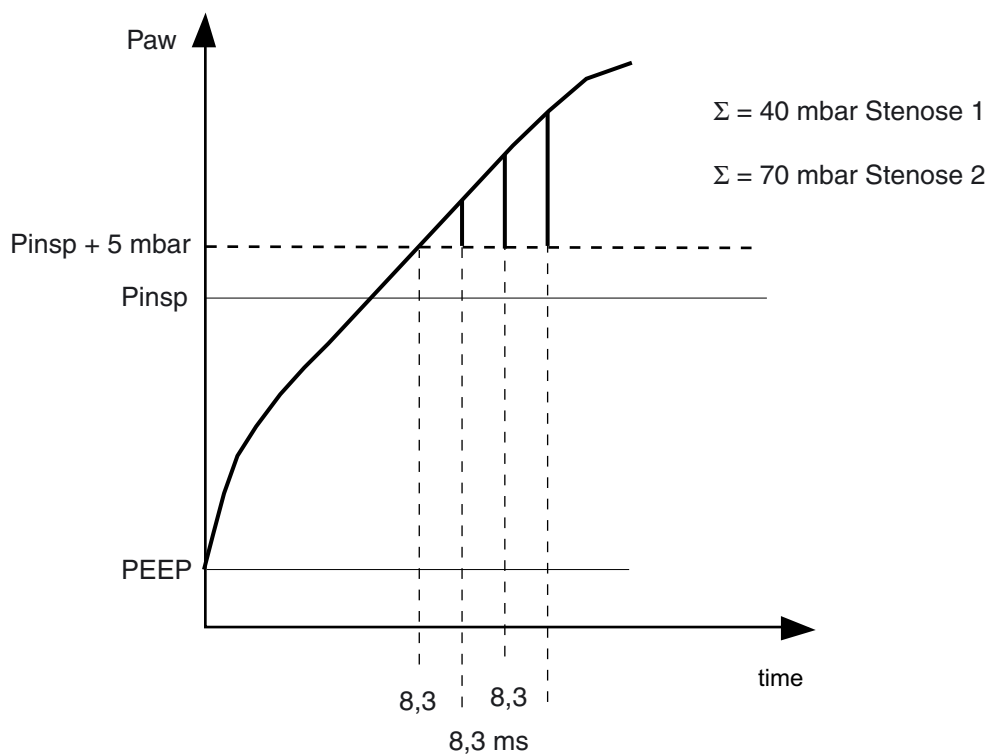


Fig. 6: Dynamic stenosis limit



## 4.6 Minute Volume Monitoring (Babylog 8000/Babylog 8000 plus)

The abbreviation MV (for minute volume) is used in the following text.

### 4.6.1 Babylog 8000 with Software Versions 2 and 3

The monitoring menu is used to set the upper and lower alarm limits in the range of 0.03 L/min to 15 L/min. The upper and lower alarm limits are continuously compared with the measured MV value. If the value exceeds the upper alarm limits or falls below the lower alarm limit, the system will activate an alarm. Monitoring is deactivated during calibration of the flow sensor (Babylog 8000) to allow the measured MV value to stabilize. If the flow measurement system fails, the MV monitoring becomes ineffective.

### 4.6.2 Babylog 8000 Software with Version 4.0 or Higher

The monitoring menu is used to set the upper and lower alarm limits in the range of 0.00 L/min to 15 L/min. The upper and lower alarm limits are continuously compared with the measured MV value. If the value exceeds the upper alarm limits or falls below the lower alarm limit, the system will activate an alarm. Monitoring is deactivated during calibration of the flow sensor (Babylog 8000) to allow the measured MV value to stabilize. If the flow measurement system fails, the MV monitoring becomes ineffective.

### 4.6.3 Babylog 8000 plus

Babylog 8000 plus has the software 5.n.

## 4.7 Audible Alarm Generator Monitoring

Babylog has two audible alarm generators (loudspeaker and piezo). During normal operation, the loudspeaker is the audio interface to the operator in the event of alarms. The piezo is only used in the event of power or loudspeaker failure.

At the end of the self-test, the loudspeaker is triggered with a test signal. This test signal is monitored with a microphone. If there is no feedback, Babylog generates error 817.

## 4.8 Operating Voltage Monitoring

During operation, Babylog uses comparators to continuously monitors whether the operating voltages are within specified limits.

When Babylog is switched on, these comparators are checked by a defined changing of the comparator reference voltage.

## 4.9 Rotary Potentiometer Monitoring

Input via rotary potentiometers are processed by two channels. Two microprocessor systems read the input via independent channels and compare the results.

#### 4.10 ROM Test

During operation, the ROM area used is summed up per byte in a long word variable (long word = 32 bits) which is compared to the check sum stored in the ROM. If the check sums do not match, an error message will be displayed.

#### 4.11 RAM Test

During operation the RAM area used is tested with a simple algorithm. By writing 55 hex or AAhex in each cell every bit is checked for settability and resettability.

#### 4.12 Temperature Monitoring

A temperature sensor measures the internal temperature of the Babylog. If the temperature is not within the range of  $-20\text{ °C}$  to  $75\text{ °C}$ , an alarm will be generated. If the temperature is too high, a message will inform the operator about a possible failure of the fan.

#### 4.13 Relay and Valve Monitoring

An excess-current monitoring function is integrated into the trigger electronics of the valves. The excess-current monitoring function is tested after switching on Babylog. If a valve is switched on and operated with the operate voltage for an excessive period of time, the excess-current monitoring function responds within a specific time.

The relay which enables de-energizing of the whole pneumatics assembly is also tested once after power-on. For this purpose, the relay is switched on and off once and the voltages at the relay contact are measured.

During operation, the system checks whether the voltage at the relay contact corresponds to the switching condition.

#### 4.14 Battery Monitoring

Babylog has a rechargeable Nicd battery for power failure alarms.

The battery is recharged automatically during operation and its charge checked periodically.

An error message is displayed if the voltage is too high or too low.

#### 4.15 Flow Measurement Monitoring (Babylog 8000/ Babylog 8000 plus)

During operation, the flow sensor is checked for correct functioning, freedom of damage and intact contacts.

## 5 Alarms, Cautions and Advisory Messages

The alarm structure of the Babylog has three priority levels:

Alarm	-	Immediate action required.
Caution	-	Checking required.
Advisory	-	Information for the operator.

The priority level is indicated by the different tone sequences of the individual audible alarm.

### 5.1 Message Display

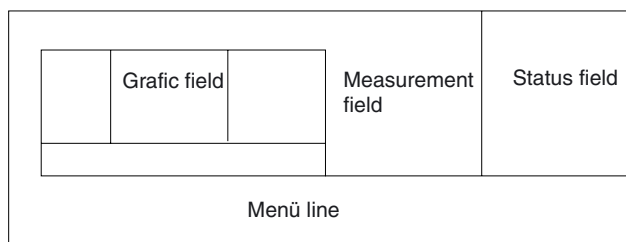
When an alarm occurs the corresponding message is displayed as plain text message in a window of the display. The message can be canceled momentarily by pressing the Reset/Check key (or OK key as of software version 5.n). After a certain time out, the message appears again if its cause still exists.

If several alarms have occurred simultaneously, the highest-level alarm is shown on the display. Other alarms will be queued. A message whose cause no longer exist will not be displayed any more.

### 5.2 Display and Menu

The display shows parameters and text messages. The functions of Babylog are set with keys and potentiometers.

The screen is separated into different areas:



**Fig. 7:** Screen display structure

- The graphics field displays real-time curves.
- The measured-value field displays monitoring parameter in digital representation.
- The status field displays the operating mode and other status information.
- The menu line displays the current function of the keys below the screen.

In some cases, the graphics and measured-value fields are combined to form one large field.

### **5.2.1 Babylog 8000/Babylog 8000 SC with LC Display**

The Monitoring/Mode key and the six keys below the LC display are used for the menu. The Monitoring/Mode key toggles between the two main menus, the monitoring menu and the mode menu. This works from any menu status always reaching the basic status of the other main menu. The function of the keys depends on the respective menu status and is indicated in the menu line of the display by an abbreviation or a symbol.

### **5.2.2 Babylog 8000/Babylog 8000 plus with EL Display**

The key "Vent. Mode" activates the menu for the ventilation modes. The key "Vent. Option" activates the menu for the additional functions of the ventilation modes.

## 6 Function of the Control Elements

The control elements comprise the potentiometers (rotary knobs) and the keys.

### 6.1 Potentiometers (Rotary Knobs)

#### 6.1.1 Fraction of inspired O<sub>2</sub> (O<sub>2</sub> vol.%)

This potentiometer is used to set the fraction of inspired O<sub>2</sub> to a value between 21 vol.% and 100 vol.%. The adjusted value becomes effective immediately.

#### 6.1.2 Inspiratory time (T<sub>I</sub>)

This potentiometer is used to set the inspiratory time to a value between 0.1 s and 2 s. The adjusted value becomes effective at the end of the current respiratory cycle.

#### 6.1.3 Expiratory time (T<sub>E</sub>)

This potentiometer is used to set the expiratory time to a value between 0.2 s and 30 s. The adjusted value becomes effective at the end of the current respiratory cycle.

#### 6.1.4 Inspiratory flow (Insp. Flow)

This potentiometer is used to set the inspiratory flow to a value between 1 L/min and 30 L/min. The adjusted value becomes effective immediately.

#### 6.1.5 Inspiratory pressure limit (P<sub>insp</sub>)

This potentiometer is used to set the inspiratory pressure limit to a value between 10 mbar and 80 mbar. A value above 40 mbar must be confirmed by pressing the Reset/Check key (or OK key as of software version 5.n). A message is displayed. This pressure limit is also effective when a manual breath is applied. The adjusted value becomes effective immediately.

#### 6.1.6 PEEP/CPAP

This potentiometer is used to set the end-expiratory pressure for controlled ventilation or to set the continuous positive airway pressure for spontaneous breathing to a value between 0 mbar and 15 mbar (or 25 mbar as of software version 4.n). A value above 8 mbar must be confirmed by pressing the Reset/Check key (or OK key as of software version 5.n). A message is displayed. The adjusted value becomes effective immediately.

## 6.2 Keys

### 6.2.1 CPAP

Pressing this key will activate the CPAP mode. The current respiratory cycle is stopped before a new mode becomes active (for example, IPPV/IMV). This key is protected against unintentional operation by a software-controlled locking. After power-on, Babylog will automatically enter the most recent mode selected.

### 6.2.2 IPPV/IMV (CMV) (up to software version 4.n)

Pressing this key will activate the controlled ventilation mode. This key is protected against unintentional operation by a software-controlled locking. If CPAP was set before, the first mandatory breath is applied after the last expiratory phase has been completed (zero expiratory flow) or after a zero flow has been measured at the Y-piece for one second.

The CPAP and IPPV/IMV keys deactivate each other. The selected ventilation mode is indicated by a green LED on the respective key.

### 6.2.3 Man. Insp.

Pressing this key will apply a breath at the set inspiratory flow rate and the set pressure limit (P<sub>insp</sub>). This breath is stopped when the key is released or when a fixed time limit of 5 s is reached. The next manual or mandatory breath can only be applied after an expiratory phase (IPPV/IMV) has been completed. If a manual breath is stopped by the time limit, the next mandatory or manual breath can only be applied after a fixed time-out (5 s).

### 6.2.4 2-min Silence

Pressing this key will silence the audible alarm for 2 minutes. This status is indicated by the yellow LED on the key. Pressing the key again within the silence time will reactivate the audible alarm.

### 6.2.5 Reset/Check (OK)

Pressing the Reset/Check key (or OK key as of software version 5.n) will confirm or cancel text messages shown on the display. The message currently shown on the display will be cancelled and the audible alarm will be silenced.

Pressing the key for a longer period of time (approx. 2 s) will start a display test and an audible alarm generator test.

### 6.2.6 Backlight On/Off (Babylog 8000/8000 SC with LC Display)

Pressing this key will switch the LCD backlight on or off.

### 6.2.7 "Cal. Config." (as of software version 5.n)

Pressing this key will activate the calibration mode.

### 6.2.8 Keys

The keys below the display have no fixed function. Their function depends on the operating status of the menu.

#### Additional Key on the Operator Panel

This key has not been assigned a function yet. It is reserved for future extensions.

## 7 Cold Start/Warm Start Behavior

A distinction is made between an intentional switch-off with the power switch and a power failure. If a power failure is recognized, the position of the low voltage contacts of the power switch is evaluated.

### 7.1 Cold-Start Behavior

When Babylog is switched off, all set parameters and data on the power switch state are stored. When switching on the Babylog, this information is reloaded and a "cold start" is carried out. Babylog initializes, carries out its function tests, indicates the results of these tests, and starts ventilation.

### 7.2 Warm-Start Behavior

A "warm start" is carried out after a power failure. Babylog does not carry out a self-test, but starts ventilation immediately. It continues to work with the previously set parameters. A visible and audible alarm is active during power failure.



## 8 Description of Pneumatic Functions

### 8.1 Gas Supplies

AIR and O<sub>2</sub> flow through the filters F 1.1 and F 1.2 and the check valves D 1.1 and D1.2 to the pressure regulators DR 1.1 and DR 1.2 which regulate the gases to a constant system pressure.

From the pressure regulators DR 1.1 and DR 1.2 the gases flow to the mixing and flow-control unit. The gas mixture created there flows through the inspiratory line to the patient.

AIR and O<sub>2</sub> are taken downstream of the pressure regulators DR 1.1 and DR 1.2 and delivered to the solenoid Y 1.1. If one of the gases fails, this solenoid switches over to the other one.

If the power supply is interrupted or if a stenosis 2 situation has occurred, solenoid Y 1.2 switches over to emergency venting.

The gas for O<sub>2</sub> calibration flows through solenoid Y 1.3.

The gas required to control the ejector flows through solenoid Y 1.4.

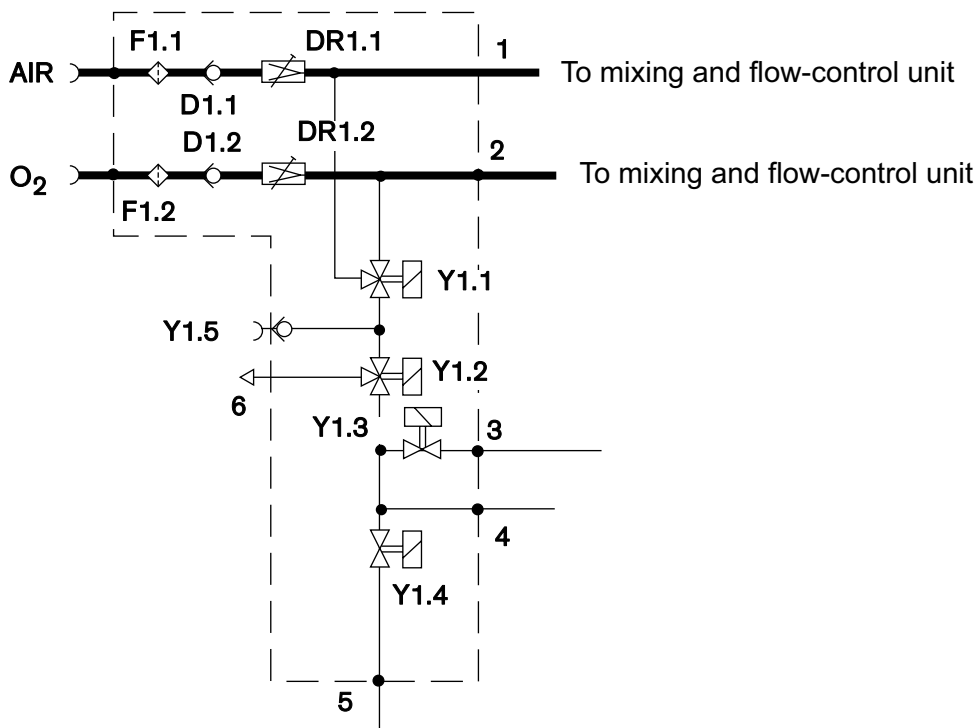


Fig. 8: Compressed-gas connection

## 8.2 Controlled Ventilation

A continuous flow of gas is delivered to the Y-piece through the inspiratory line. The fraction of inspired  $O_2$  is measured at the  $O_2$  sensor S 3.1 through the open pneumatic valve Y 3.1. Safety valve Y 3.3 prevents overpressure in the ventilation system, for example, if the expiratory line is blocked.

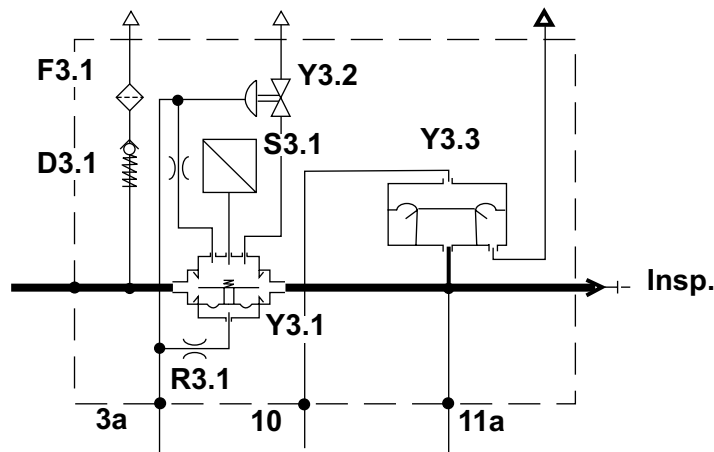


Fig. 9: Inspiratory Block

### 8.2.1 Inspiration

The PEEP control valve 4 triggers the expiratory valve Y 5.1 causing it to close the expiratory side. The continuous flow of gas is delivered to the patient's lung. The airway pressure is measured by the two relative pressure sensors S 6.3 and S 6.4. The inspiratory pressure limit is controlled by expiratory valve Y 5.1.

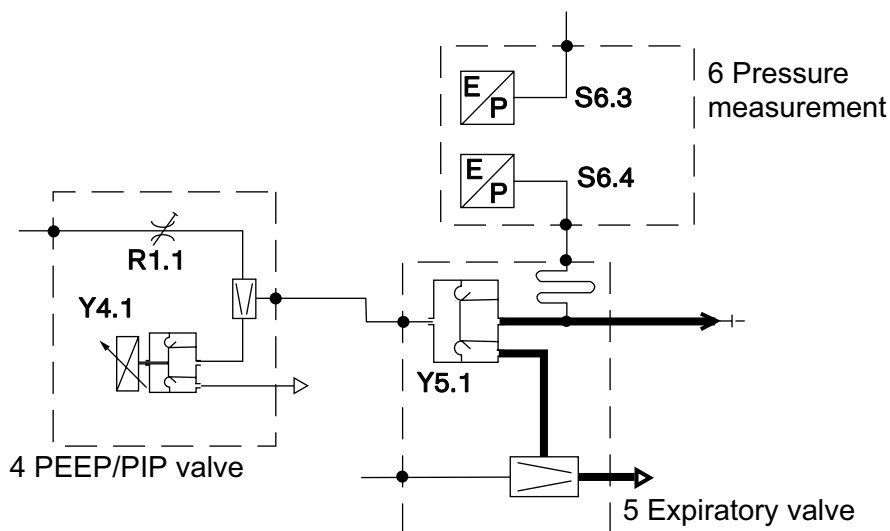


Fig. 10: Expiratory valve, PEEP/PIP valve, and pressures measurement

### 8.2.2 Expiration

The PEEP control valve Y 4.1 vents the control pressure at the expiratory valve Y 5.1. The expiratory valve Y 5.1 opens the ventilation system. Expiration takes place through the open expiratory valve Y 5.1. The ejector, which is driven through the open solenoid Y 1.4, supports expiration.

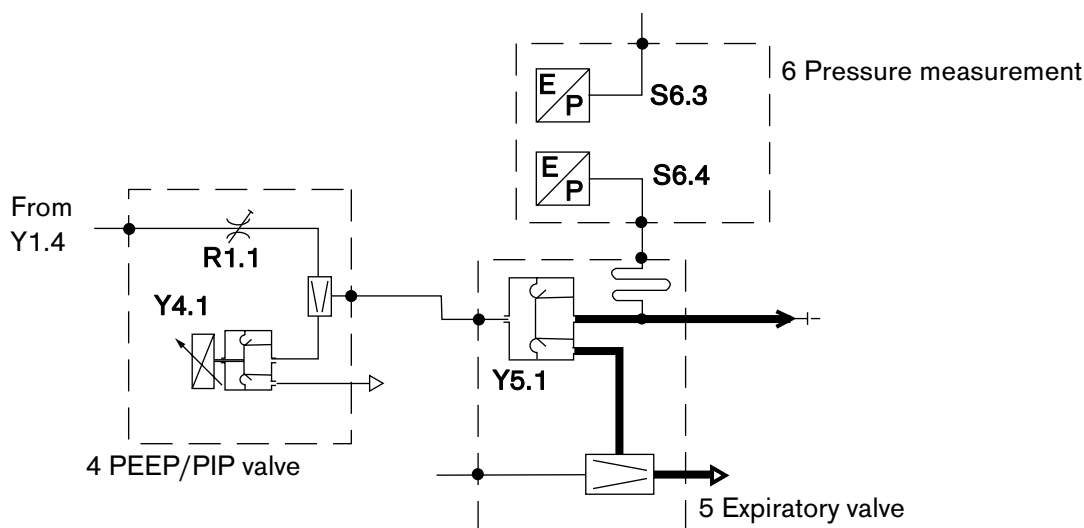


Fig. 11: Venting

### 8.2.3 PEEP

The PEEP/PIP valve is a pressure regulating valve which generates a control pressure of -19 mbar to +80 mbar. Control pressures are used to trigger the inspiratory and expiratory valves in order to deliver the peak inspiratory pressure (PIP) during inspiration and the positive end-expiratory pressure (PEEP) during expiration to the patient-side valves.

An ejector integrated into the valve allows a negative control pressure of up to -19 mbar.

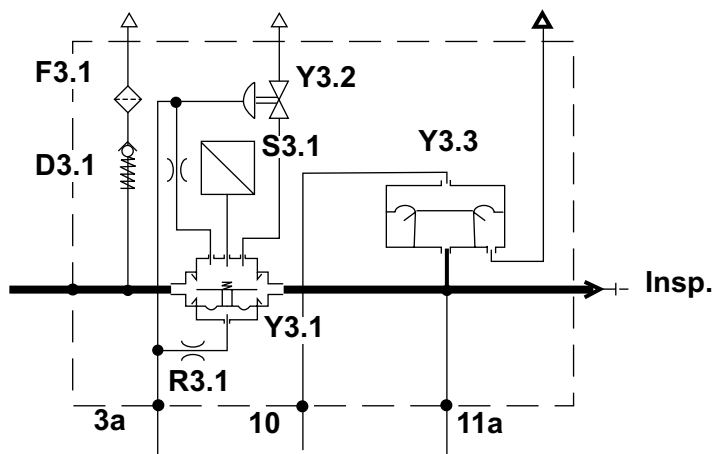
### 8.2.4 CPAP

The control pressure generated by the PEEP control valve Y 4.1 acts on the control side of the expiratory valve Y 5.1 and builds up a continuous positive airway pressure in the ventilation system.

## 9 Measurement of the Ventilation Parameters

### 9.1 O<sub>2</sub> Measurement

The O<sub>2</sub> sensor continuously measures the fraction of inspired O<sub>2</sub> through the open pneumatic valve Y 3.1.



**Fig. 12:** Measurement of the fraction of inspired O<sub>2</sub>.

An automatic two-step calibration is carried out at 24-hour intervals.

AIR is supplied to the pneumatic valve Y 3.1 through solenoids Y 1.1, Y 1.2, and Y 1.3. The pneumatic valve Y 3.1 closes the connection between the O<sub>2</sub> sensor S 3.1 and the inspiratory line. The pneumatic valve Y 3.2 is opened while, at the same time, the O<sub>2</sub> sensor is purged with AIR through the restrictor R 3.2 for approximately 2.5 minutes.

Then, purging with O<sub>2</sub> is carried out in the same way. After calibration, the solenoid Y 1.1 switches back to AIR, the solenoid Y 1.3 closes, the pneumatic valve Y 3.2 closes, too, and the pneumatic valve Y 3.1 reconnects the O<sub>2</sub> sensor to the inspiratory line.

### 9.2 Measurement of the Airway Pressure

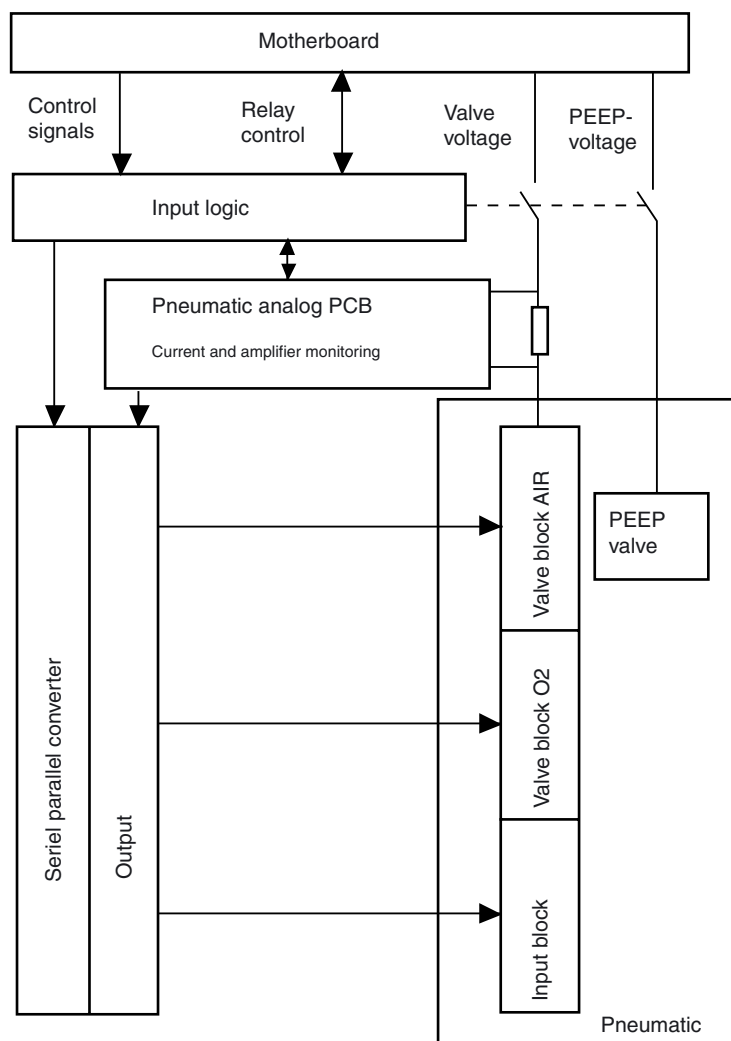
Due to the continuous flow, the inspiratory measurement results in a value that is higher than the value measured at the Y-piece. Since an expiratory measurement results in a value which is too low, an average value is calculated from the measured values of the relative pressure sensors and displayed on the screen.

A bactericidal metering pipe prevents contamination of the pressure sensor with expiratory gas.

### 9.3 Pneumatics Control PCB

The Pneumatics Control PCB is the output unit of the CPU 68000. It receives serial data from the I/O PCB and triggers the corresponding valves.

Further functions of Pneumatics Control PCB: voltage supply to the patient system heater, power supply to the PEEP/PIP valve.



**Fig. 13:** Block diagram of the Pneumatics Control PCB

### 9.4 Pneumatics Analog PCB

The Pneumatics Analog PCB controls and monitors the operate voltage and the withstand voltage to the valves. The Pneumatics Analog PCB is installed on the Pneumatics Control PCB.

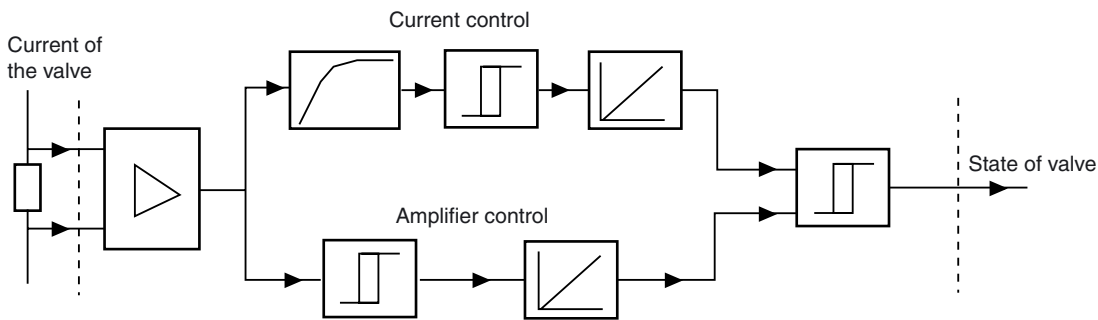


Fig. 14: Block diagram of the Pneumatics Analog PCB

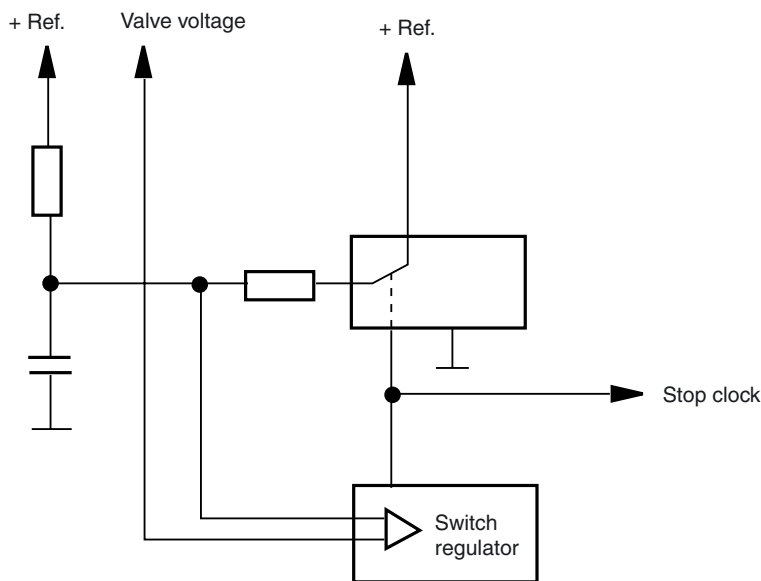


Fig. 15: Block diagram of the Pneumatics Analog PCB

## 9.5 Patient System Heater

The patient system heater consists of a heating resistor located at the expiratory-valve connection.

## 9.6 Pressure Sensor Base PCB

The Pressure Sensor Base PCB has four pressure sensors for the measurement of  $P_{\text{insp}}$ ,  $P_{\text{exp}}$ , AIR and  $O_2$  supply pressures and for coordination of the pressure and the  $O_2$  measurement signals.

## 9.7 $O_2$ Amplifier PCB

The  $O_2$  Amplifier PCB amplifies the sensor signals directly at the sensor.

## 10 Components of the Electronic Assembly

The electronic assembly consists of the following printed circuit boards and subassemblies:

- Power supply unit
- Motherboard PCB
- CPU 68000 PCB
- I/O PCB
- Flow PCB (Babylog 8000) (optional)
- Monitoring PCB/Watchdog PCB
- Front Adapter PCB
- Front Controller PCB (Babylog 8000/Babylog 8000 SC with LC display )
- Front PCB (Babylog 8000/Babylog 8000 plus with EL Display)
- Display PCB (Babylog 8000/Babylog 8000 SC with LC display )
- EL display (Babylog 8000/Babylog 8000 plus with EL display)
- Potentiometer field
- Display field
- Communication PCB (optional)
- Interface PCB (optional)

### 10.1 Power Supply Unit

The power supply unit supplies Babylog with the following voltages:

- +5 V
- +15 V
- –15 V
- +27 V

The power supply unit comprises the mains connection, the ON/OFF switch, and the fuses.

### 10.2 Motherboard PCB

All electrical connections between the individual printed circuit boards are led through the Motherboard PCB. Cable connections go to the front panel, to the pneumatic assembly, and to the rear panel, which contains the rechargeable battery, the fan, the loudspeaker, and the flow-sensor connection.



### 10.3 CPU 68000 PCB

The CPU 68000 PCB comprises the following components: 68000 CPU, EPROM, RAM, time-keeper RAM, address decoder, multi function peripheral (four 8-bit timers, RS 232 interface, 8-bit I/O port), DTACK and bus error generator, watchdog, power-on reset, interrupt controller, bus controller, and bus interface.

The CPU 68000 PCB is clocked with 8 MHz. If the "communication" conversion kit is installed, the clock frequency is increased to 16 MHz.

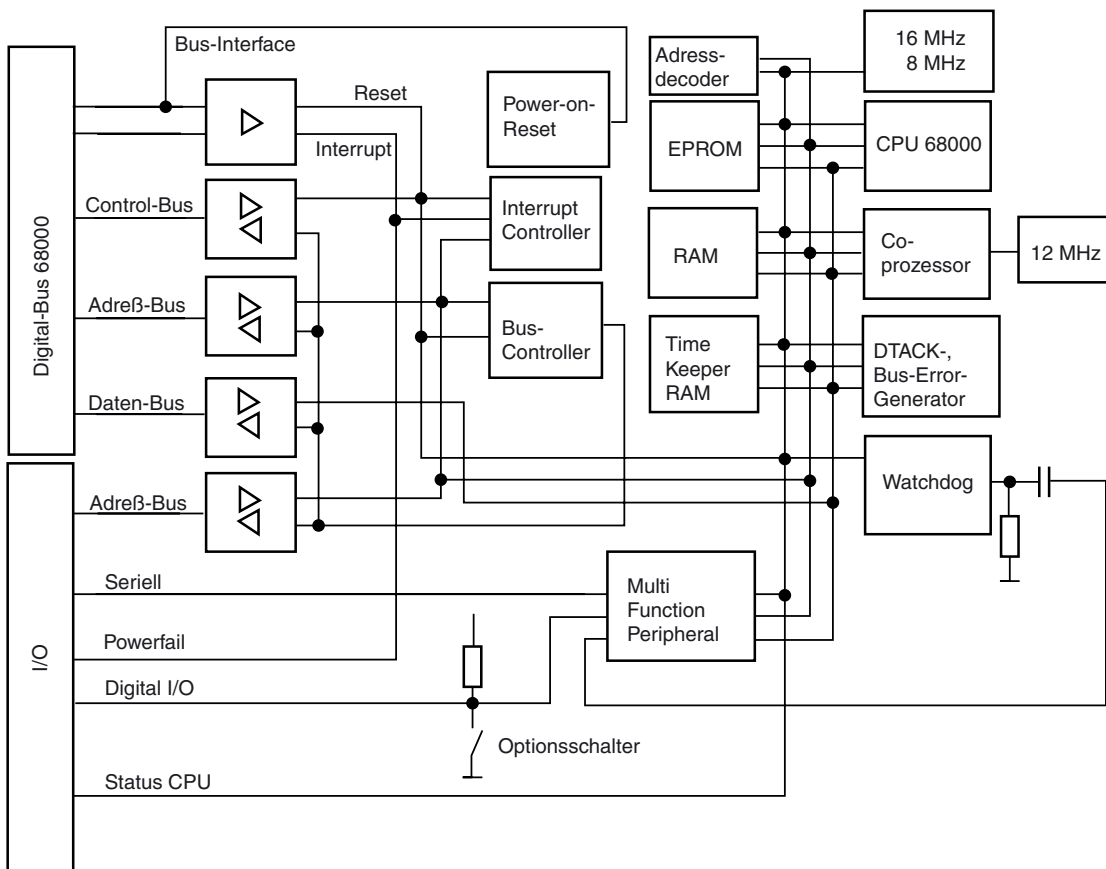


Fig. 16: Block diagram of the CPU 68000 PCB

### 10.4 I/O PCB

The I/O PCB measures the analog signals O<sub>2</sub> concentration, inspiratory pressure, expiratory pressure, AIR supply pressure, and O<sub>2</sub> supply pressure, and triggers the loudspeaker and the PEEP/PIP valve.

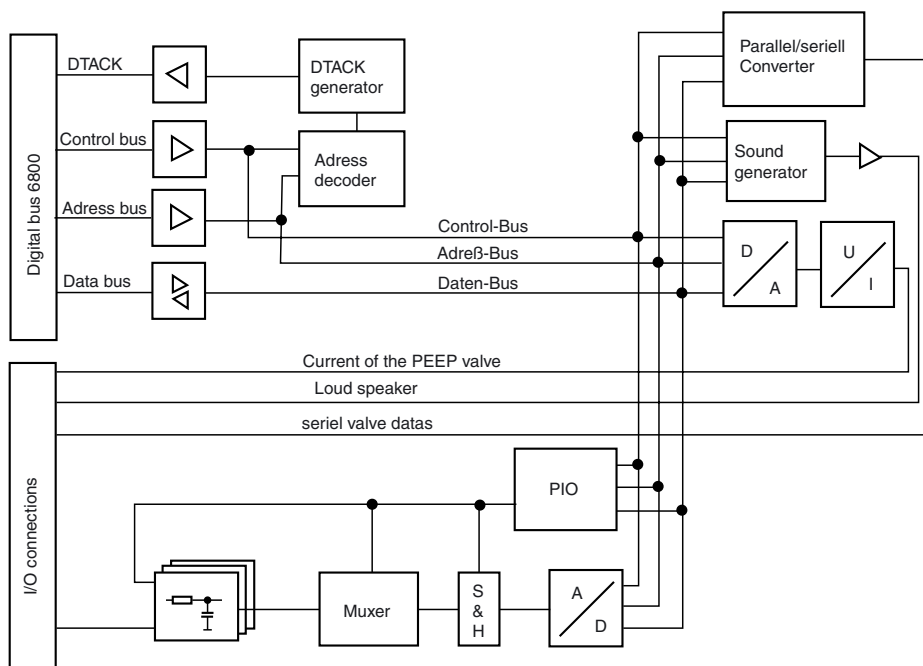


Fig. 17: Block diagram of the I/O PCB

### 10.5 Flow PCB (Babylog 8000/Babylog 8000 plus) (optional)

The Flow PCB in Babylog 8000/Babylog 8000 plus measures the flow. It provides the following function blocks: sensor bridges with sensor amplifiers, analog-to-digital converter, microprocessor Z80 minimum system, Z80-68000 bus interface.

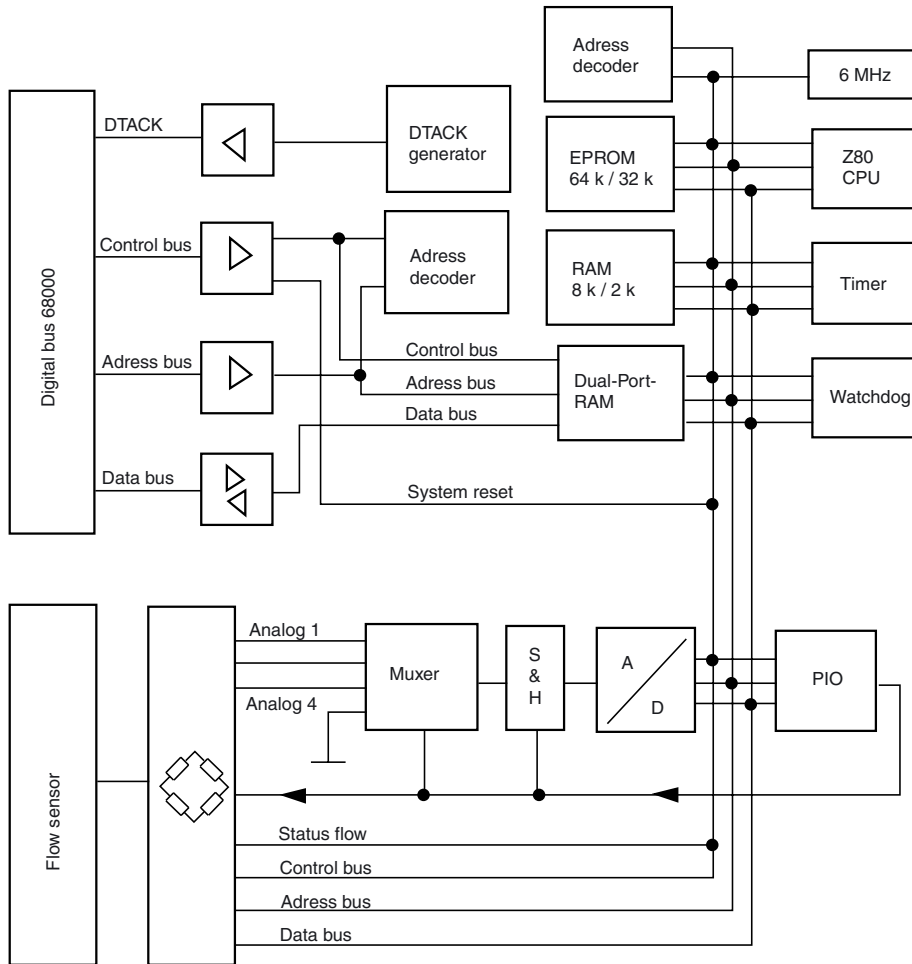


Fig. 18: Block diagram of the Flow PCB

## 10.6 Monitoring PCB

The Monitoring PCB measures and monitors all measurement and status signals. The Monitoring PCB compares these signals with the signals from the CPU 68000. If an error occurs, the Monitoring PCB switches off the valves, activates the audible alarm generator, and resets the CPU PCB.

A Z80 microprocessor (minimum system) controls the Monitoring PCB. The Monitoring PCB communicates with the CPU 68000 via a bus interface.

### 10.6.1 Measurement of Analog Signals

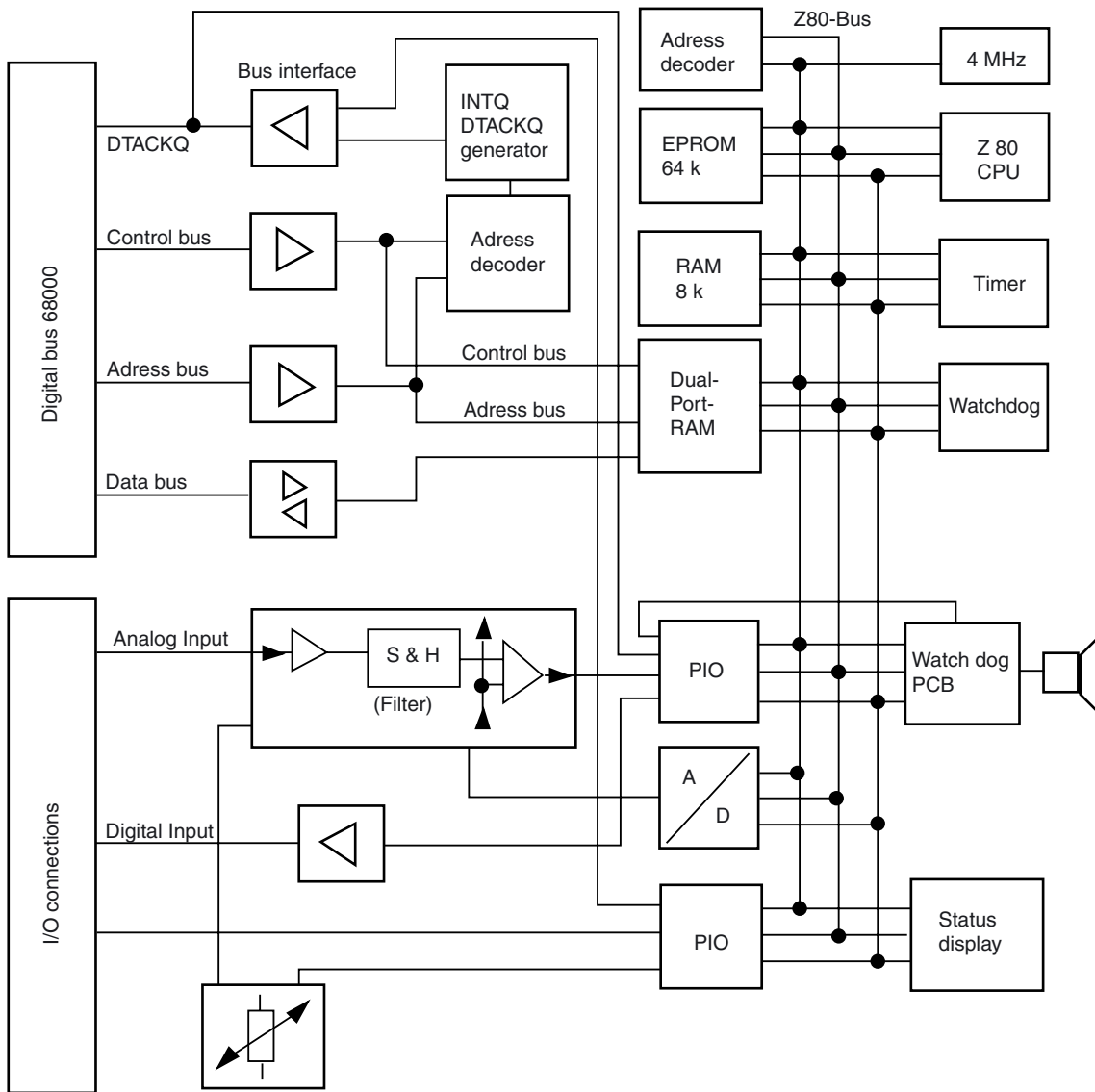
- O<sub>2</sub> concentration
- Potentiometers (O<sub>2</sub>, V<sub>insp</sub>, T<sub>I</sub>, T<sub>E</sub>, P<sub>insp</sub>, PEEP/CPAP)
- Pressure P<sub>insp</sub>
- System temperature
- Supply voltages (potentiometer reference, rechargeable battery, GNDA, GND reference, 27 V)
- Valve voltage

### 10.6.2 Measurement of Digital Inputs

- STATUS CPU 68000 (reset)
- STATUS flow (reset)
- STATUS I/O (printed circuit board is available)
- STATUS valves (current and drive monitoring on the Pneumatics Analog PCB)
- Powerfail
- Position of power switch

### 10.6.3 Measurement of Digital Outputs

- Alarm LEDs (2 LEDs on the Display PCB)
- Flow test 1 and 2 (for Flow PCB)
- Switching on of valve relays K1 and K2 (voltage supply to valves and PEEP/PIP valve on the Pneumatics Control PCB)
- CPU PCB reset
- 7-segment status display for error messages
- Standby audible alarm generator
- Loudspeaker monitoring via microphone
- Battery charging and testing circuit
- Test of the supply voltages +5 V, +15 V, –15 V (Display PCB)



**Fig. 19:** Block diagram of the Monitoring PCB

Block diagram of the Watchdog PCB of the Monitoring PCB (in new boards the Watchdog PCB is integrated into the Monitoring PCB).

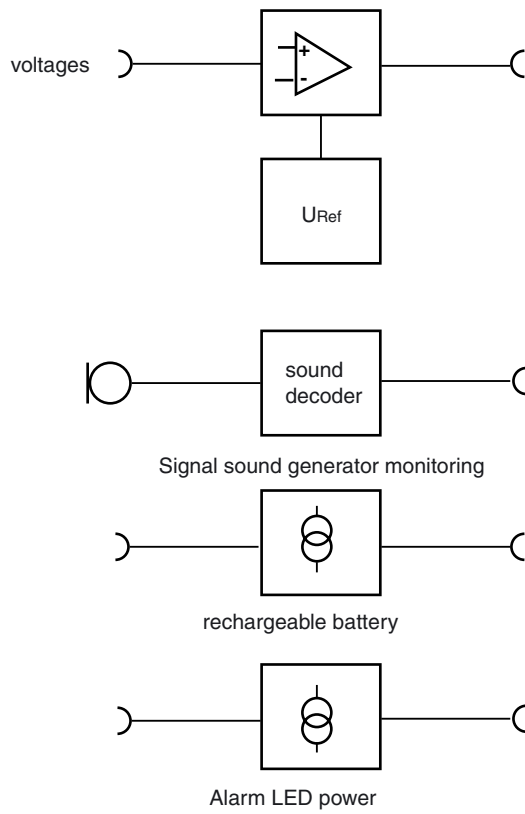


Fig.20: Block diagram of the Watchdog PCB

### 10.7 Front Adapter PCB

The Front Adapter PCB connects the CPU 68000 to the front panel. The front panels provides the control and display elements.

The Front Adapter PCB reduces the 16-bit data bus to 8 bits, generates control signals for the front panel, and controls the LC display (VIDEO RAM and LCD controller) or the EL display.

The power supply and the analog signals are led from the Motherboard PCB to the front panel through the Front Adapter PCB.

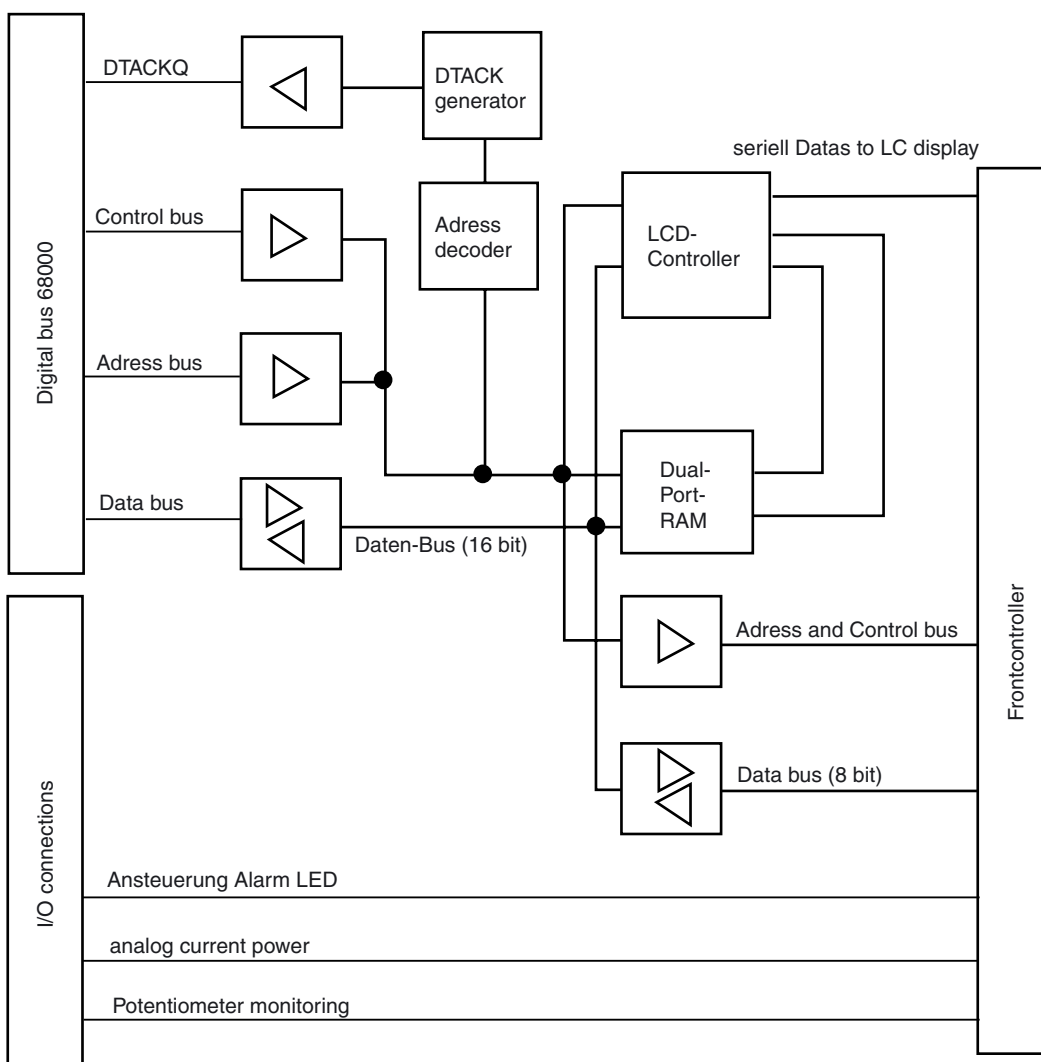
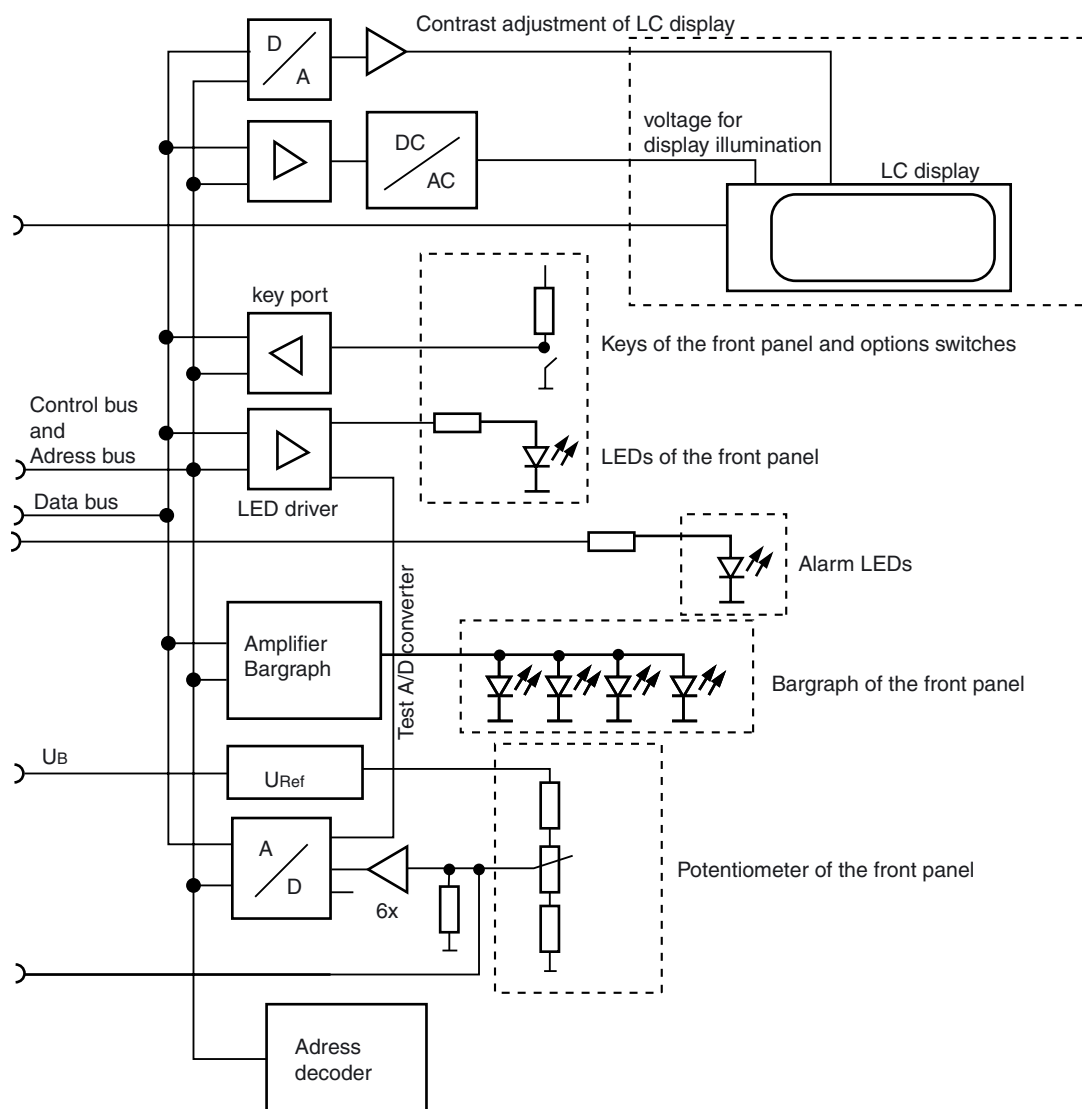


Fig. 21: Block diagram of the Front Adapter PCB

### 10.8 Front Controller PCB (Babylog 8000/Babylog 8000 SC with LC Display)

The Front Controller PCB reads in the keys of the potentiometer and display field, controls the LEDs of the potentiometer and display field, powers the LC display with operating voltage (contrast), controls the LC display backlight, and generates the control signal for the bargraph.



**Fig. 22:** Block diagram of the Front Controller PCB (Babylog 8000/8000 SC with LC display)



### 10.9 Front PCB (Babylog 8000/Babylog 8000 plus with EL Display)

The Front PCB reads in the keys of the potentiometer and display field, controls the LEDs of the potentiometer and display field, powers the EL display with operating voltage (contrast), and generates the control signal for the bargraph.

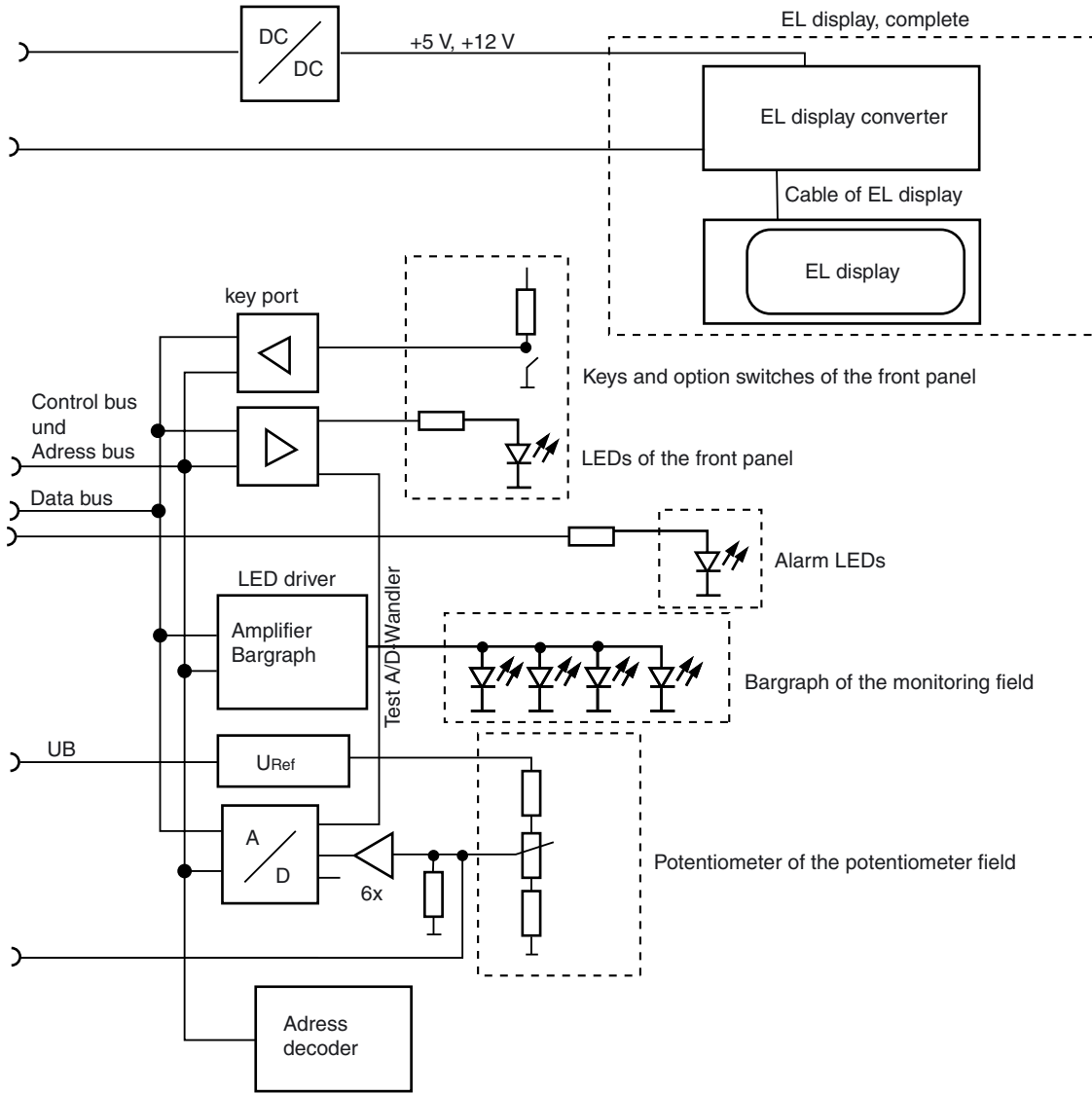
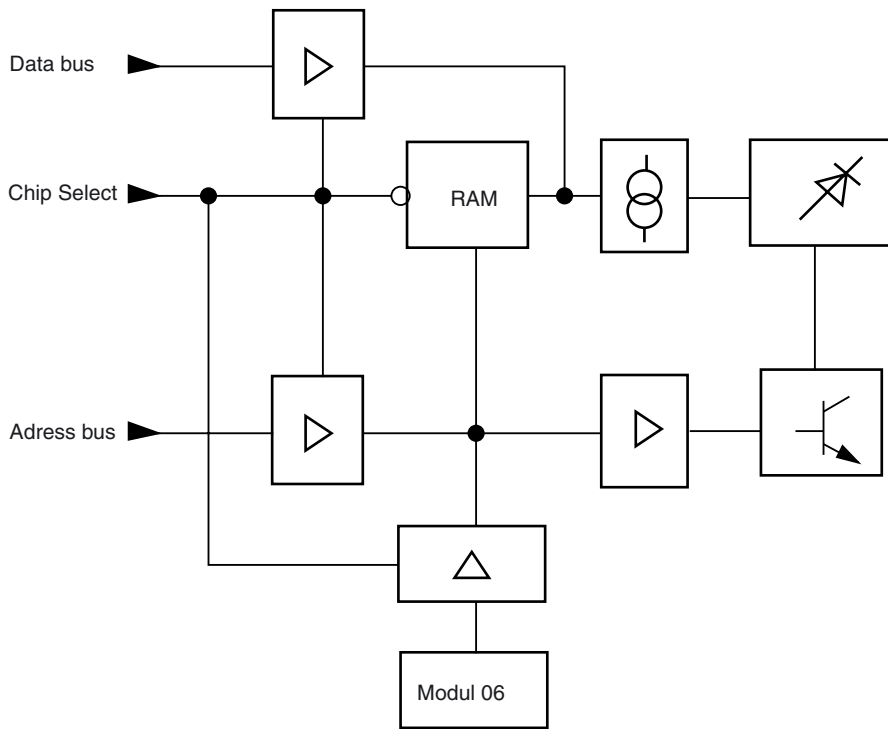


Fig. 23: Block diagram of the Front PCB

### 10.10 Display PCB (Babylog 8000/Babylog 8000 SC with LC Display)

The Display PCB contains the control electronics for the LED array of the bargraph.



**Fig.24:** Block diagram of the Display PCB

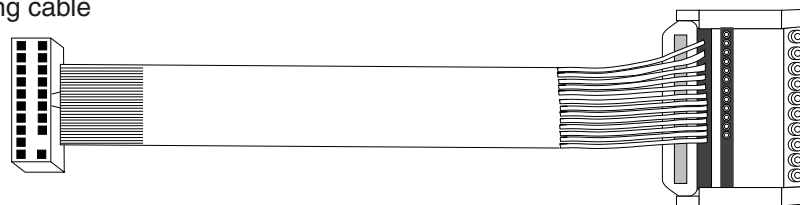
### 10.11 EL display (Babylog 8000/Babylog 8000 plus with EL Display)

The EL display (**E**lectro **L**uminescence **D**isplay) consists of the EL display, the EL display converter, and the EL display connecting cable. The EL display displays the signals and other information. The EL display converter generates the (200-240 V a.c.) voltage for the luminescence voltage of the EL display. The EL display and the converter are "matched".

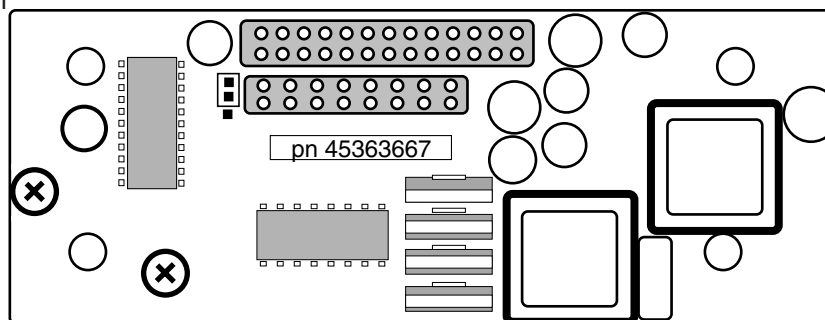
EL display



EL display connecting cable



EL display converter



**Fig. 25:** Components of EL display

## 10.12 Potentiometer Field

The Potentiometer Field comprises the following components:

- 6 potentiometers ( $O_2$  vol.%,  $T_I$ ,  $T_E$ , Insp. Flow,  $P_{insp}$ , PEEP/CPAP)
- 9 LEDs ( $O_2$  vol.%,  $T_I$ ,  $T_E$ , Insp. Flow,  $P_{insp}$ , PEEP/CPAP, CPAP, IPPV, reserve)
- 3 keys (CPAP, IPPV, reserve) (Vent. Mode, Vent. Option, reserve as of software version 5.n)

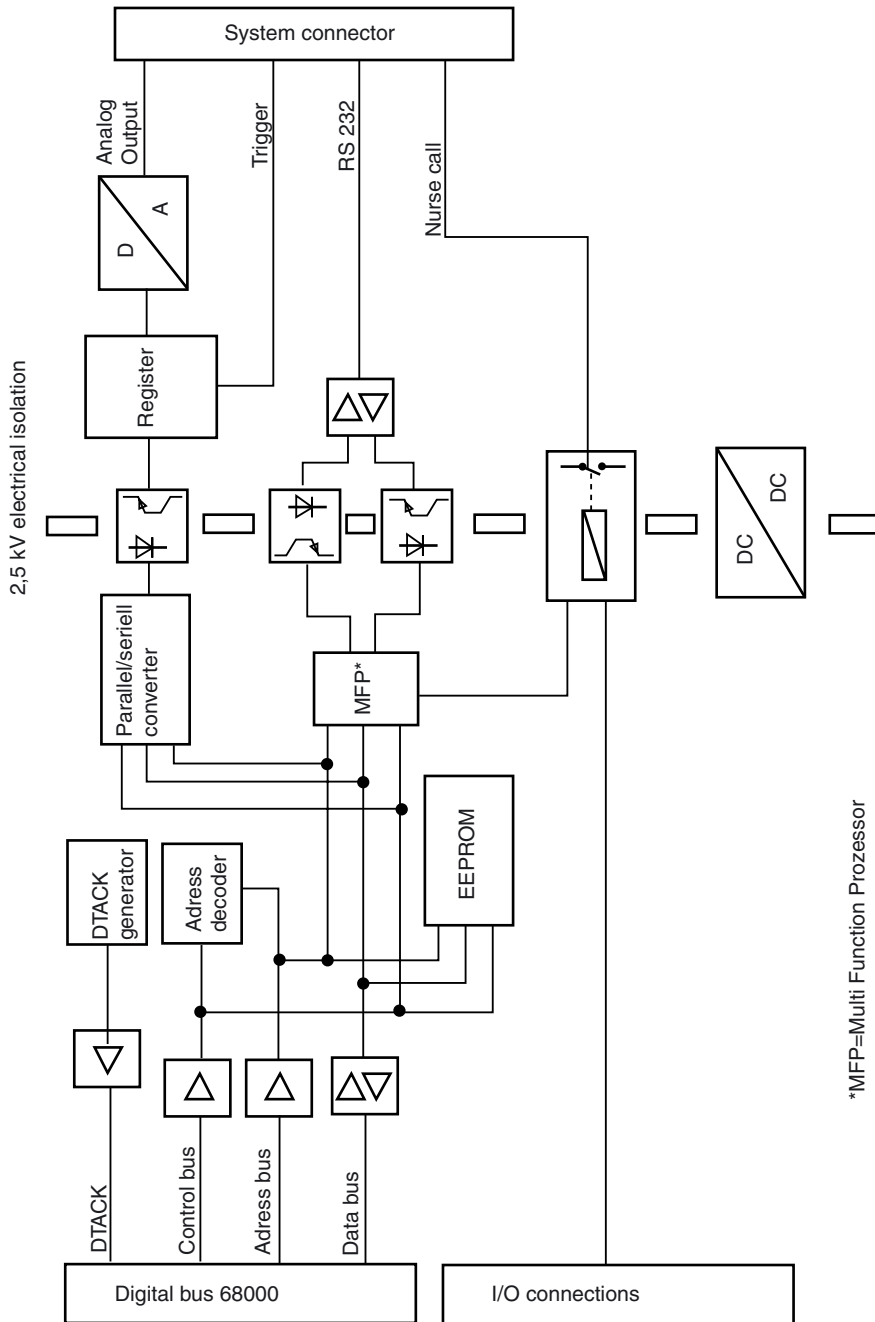
## 10.13 Display Field

The display field contains the following components:

- 11 keys (silence, reset, man./insp., menu, keys 1 to 6, light). The "light" key is only available on Babylog 8000 with LC display. The key signals are read in via the Front Controller PCB or the Front PCB.
- LED array of the bargraph. The LED array is controlled via the Display PCB.
- 7 LEDs (warning (yellow), mode, monitoring, silence, triggers 1 to 3). The LEDs are controlled via the Front Controller PCB or the Front PCB.
- 2 red alarm LEDs. The LEDs are controlled via the Monitoring PCB/Watchdog PCB.

### 10.14 Communication PCB

The Communication PCB controls an external printer, a computer, and an analog recorder. The Communication PCB is equipped with an RS232 interface, two 12-bit D/A outputs, and one digital trigger output. All outputs are electrically isolated from the electronics. Software version 3.00 or higher, a CPU PCB with 16 MHz (the CPU PCB with 8 MHz was standard until end of 1992) and the Interface PCB with outputs on the rear panel are minimum requirements for operation.



**Fig. 26:** Block diagram of the Communication PCB

### 10.15 Interface PCB

The Interface PCB is a passive printed circuit board with the following connections:

- Flow-sensor cable
- 2 analog outputs
- Trigger output
- RS 232

The Interface PCB is required for the optional communication function.

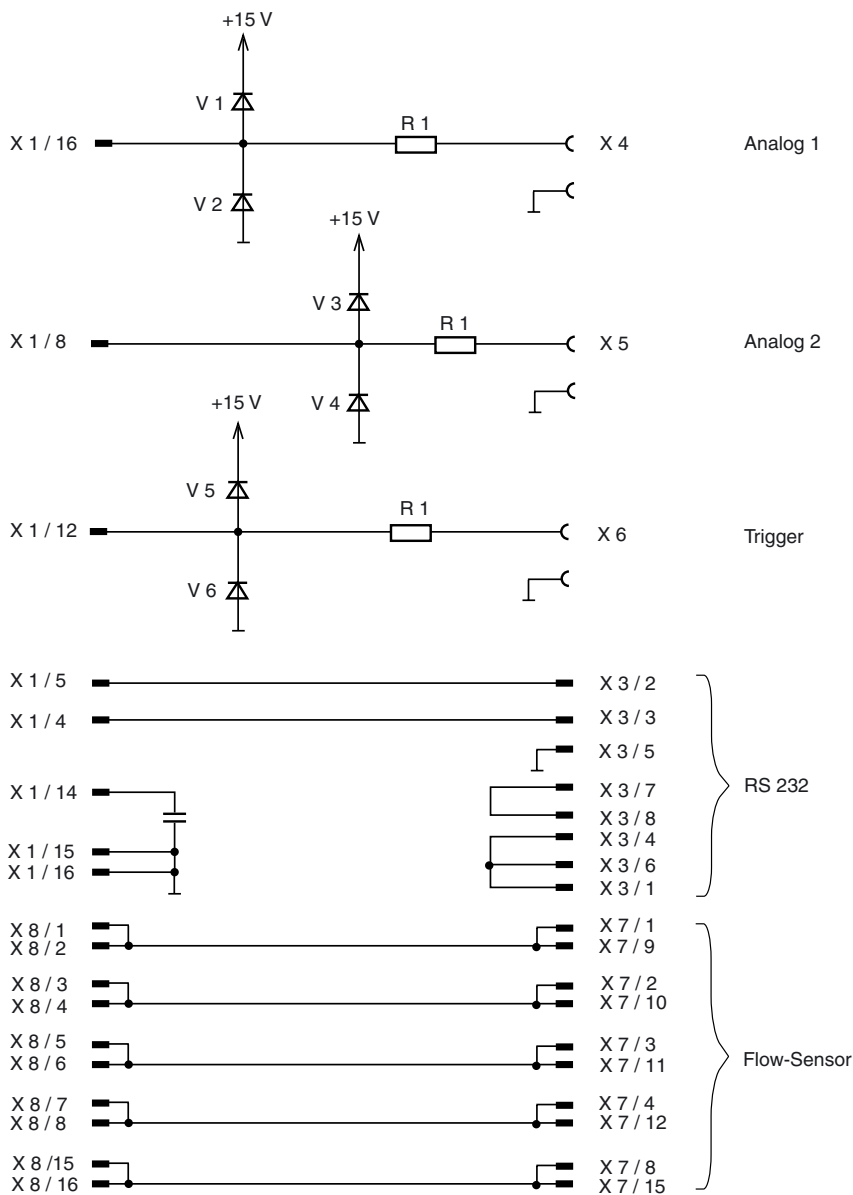


Fig.27: Interface PCB

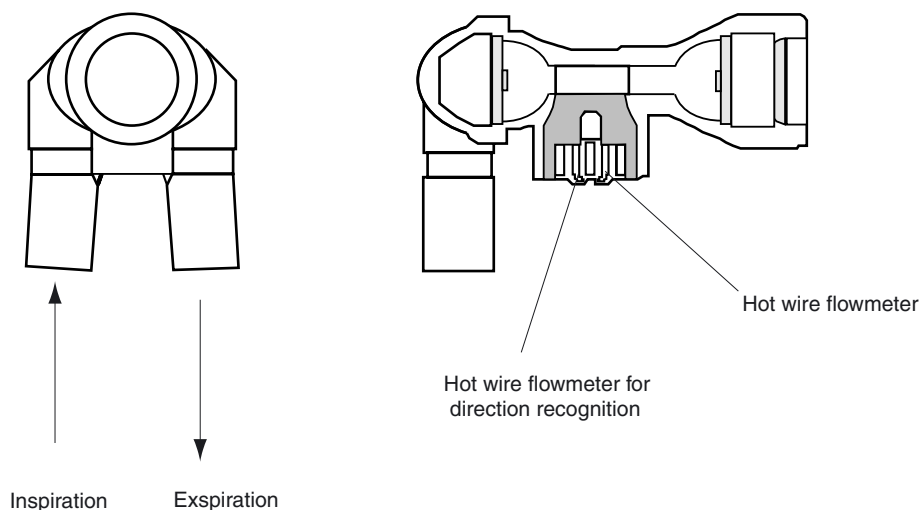
## 11 Sensors

### 11.1 Pressure Sensors

The pressure sensors function according to the piezoresistive principle. An approximately 4 mm into 4 mm silicon chip has 4 ion implanted resistors. The silicon chip is also equipped with a pressure diaphragm.

### 11.2 Y-Piece with Flow Sensor (Babylog 8000/Babylog 8000 plus)

The Y-piece with integrated flow sensor is used in pediatric respiratory gas systems. This Y-piece connects the respiratory gas hoses of Babylog 8000/Babylog 8000 plus to the patient catheter connection.

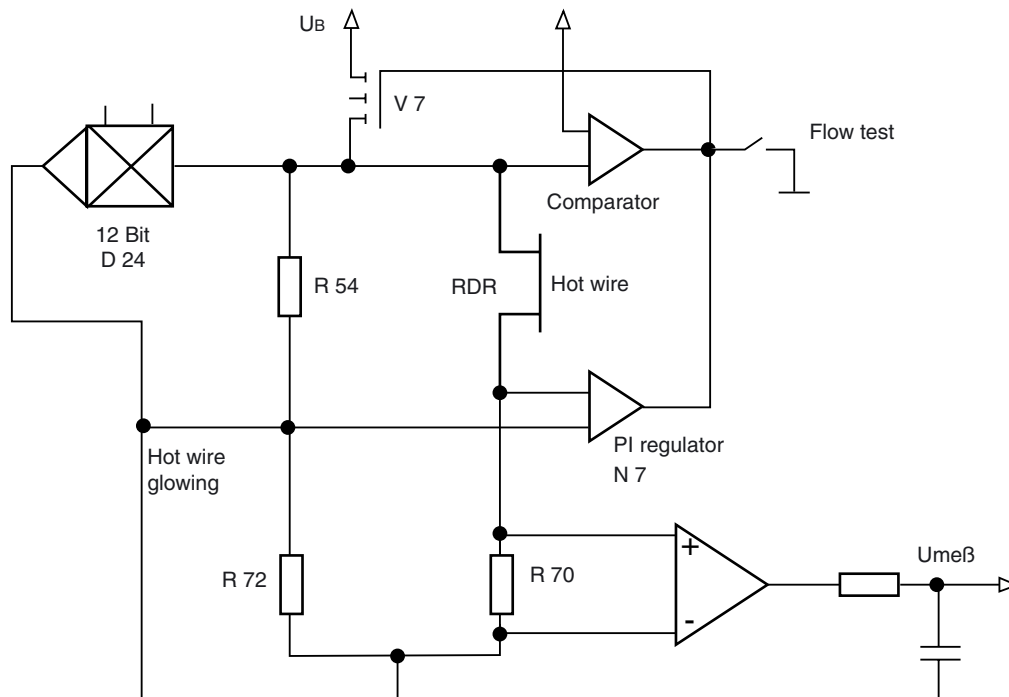


**Fig. 28:** Flow sensor

The flow sensor works according to the hot-wire flowmeter principle. It has an additional measuring wire for direction recognition.

### 11.2.1 Measuring Principle of the Flow Measuring Bridge

The flow sensor incorporates two hot-wire flowmeters. A separate wire is used for direction recognition. Both wires are evaluated on the Flow PCB by two separate measuring channels.



**Fig.29:** Principle diagram of the flow measuring bridge

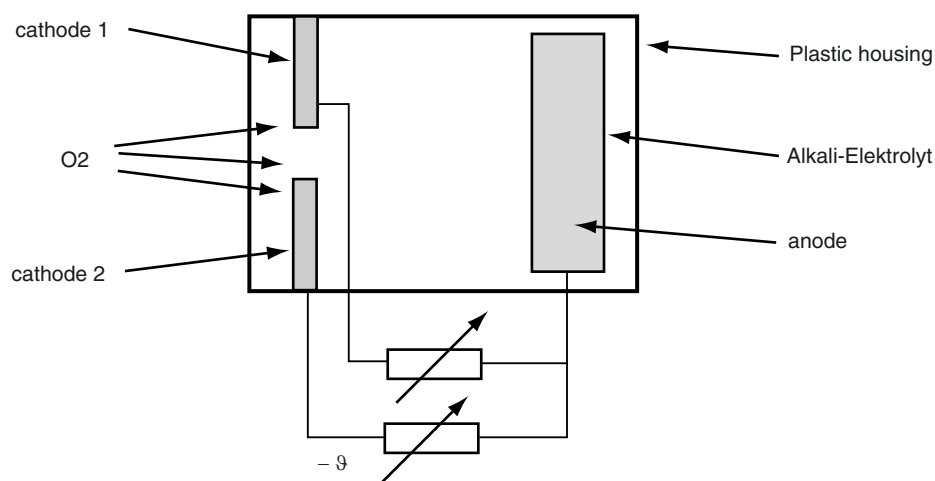
The measuring bridge comprises the resistors R 54, R 72, R 70, and the measuring wire of the sensor.

The measuring wire is kept at a constant resistance. This means that the amount of heat dissipated by the gas flow has to be readjusted. As system deviation the voltage passes through the node R 54/R 72 and the measuring wire R 70. If the voltage is adjusted to "0", the current flowing through the measuring wire and the R 70 is a measure for the heat dissipated. The controllable power source is made with V 7. N 7 is a controller with PI behavior. To adjust the bridge a current can be injected via the D/A converter D 24 into the node R 54/R 72. The current through the bridge is changed such that the wire begins to glow. Burning out of the wire is prevented by a current limiter. The current limiter compares the voltages and switches the current source off, if required. Current limitation is effected through the comparator which is connected to the input of V 7. The current through the flow measuring bridge is changed for test purposes. R 70 is a current measuring resistor (four-wire measurement) which measures the heating current (proportional voltage).



### 11.3 O<sub>2</sub> Sensor

The O<sub>2</sub> sensor is a double cell which functions according to the fuel-cell principle, that is, it is an electrochemical cell which generates a voltage by means of an ion current. The cell consists of a capsule which incorporates electrolytes, lead anodes and two gold cathodes with Teflon diaphragm.



**Fig. 30:** O<sub>2</sub> sensor cell

The oxygen to be measured diffuses through the Teflon diaphragm, undergoes a chemical reaction at the gold cathode and produces lead oxide and water at the lead anode. During this chemical process an electric voltage is generated which is proportional to the oxygen partial pressure. The gold cathodes are negative, the lead anode is positive. The internal resistance is determined by the surface of the electrodes, the oxygen diffusion velocity, and the distances. Under normal condition, the internal resistance is 700 ohms.

Like most chemical processes, this process is also temperature-dependent. Therefore, compensation resistors are connected in parallel to the sensor. These resistors correct the measuring voltage in relation to the internal resistance. Two voltages are generated which are identical within specified tolerances. The voltages are compared to each other. The two gold cathodes are arranged separately. The two voltages do not influence each other. If one gold cathode fails, the other carries out the measurement. In this case, the electronics would report a malfunction.



# Replacing Non Repairable Items



## 1 Important Information

Follow the instructions in this manual and carefully read and observe all statements following a warning or info symbol. If you ignore the warning statements, this may lead to personal injury and/or device damage.

Non-repairable items should only be replaced by qualified service personnel.

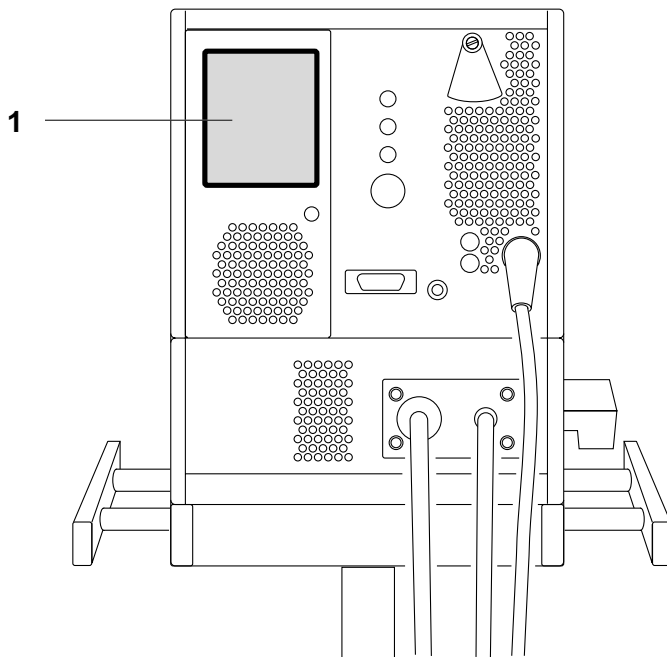
Before removing the rear panel, unplug the power plug from the mains supply and disconnect the device from the central gas supply.

Observe antistatic precautions prior to and during any corrective procedure.

After performing any repair or inspection on medical devices, carry out a final check before returning the devices to normal use.

## 2 Cleaning or Replacing the Cooling Air Filter Every 4 Weeks

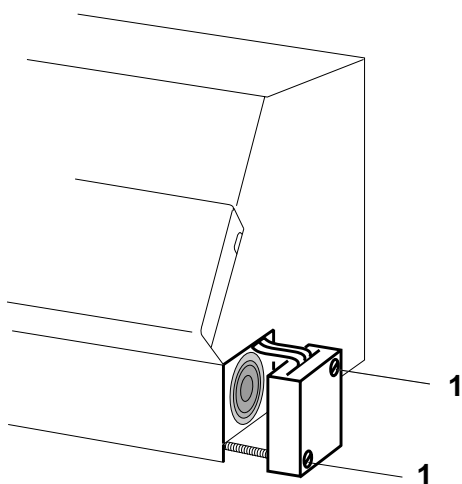
- Pull out the cooling air filter **1** from its mount in the rear panel.
- Insert a new cooling air filter or wash the old one in warm water with a few drops of dish-washing liquid. Dry well.
- Insert the cooling air filter **1** into the mount (make sure it is free of folds).



**Fig. 1:** Cooling Air Filter

### 3 Replacing the O<sub>2</sub> Sensor Capsule

- Remove the slotted-head screws **1** in the cover on the right-hand side and carefully pull the cover out.
- Pull the spent O<sub>2</sub> sensor capsule out of its mount.
- Insert the new O<sub>2</sub> sensor capsule into the mount (the ring-shaped conductors must show towards the cover).
- Push the cover in place and secure it with the screws **1**.
- Calibrate the O<sub>2</sub> sensor manually.



**Fig. 2:** O<sub>2</sub> Sensor Capsule

#### 3.1 O<sub>2</sub> Sensor Calibration

- Calibration is carried out automatically every 24 hours during operation.
- Calibration should be carried out manually after replacement of the sensor capsule.
- Calibration can be carried out manually at any time.

#### 3.2 Calibrating the O<sub>2</sub> Sensor After Replacement

- Press the key **2** in the main menu.

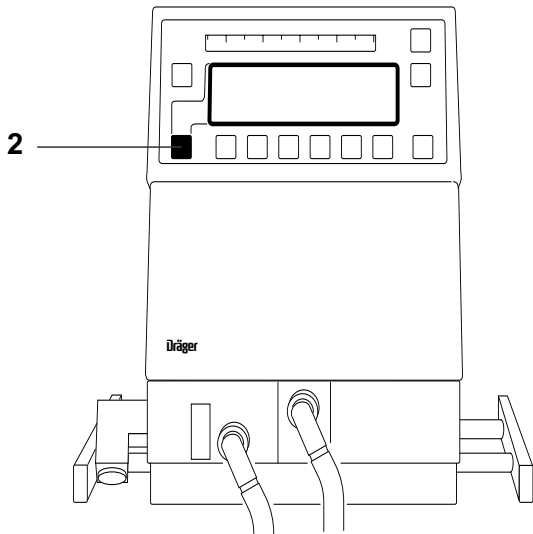


Fig. 3: Front View

The following display appears on the LCD:



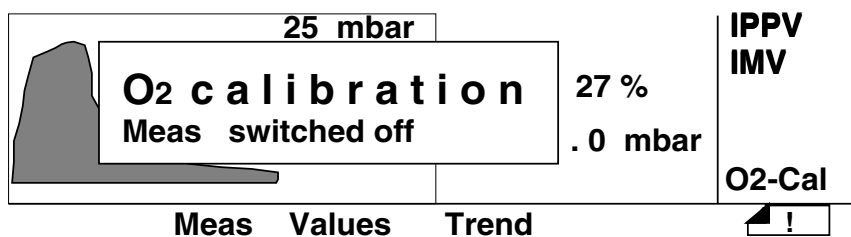
- Press the "Cal" key.

The following display appears on the LCD:





- Press the “FiO2” key.



After approx. 5 min, the display “O2 Cal” disappears from the status field and calibration is completed.

The message in the screen can be canceled as follows:

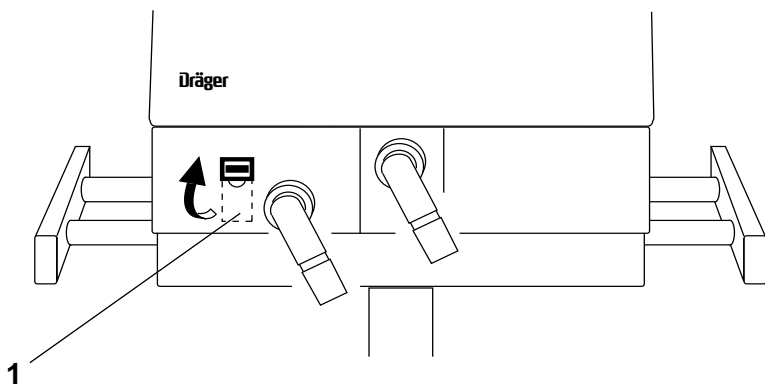
- Press the **Reset Check** key.

### 3.3 Disposing of the O<sub>2</sub> Sensor Capsule

**The O<sub>2</sub> sensor capsule is special waste. Dispose of according to local waste disposal regulations.**

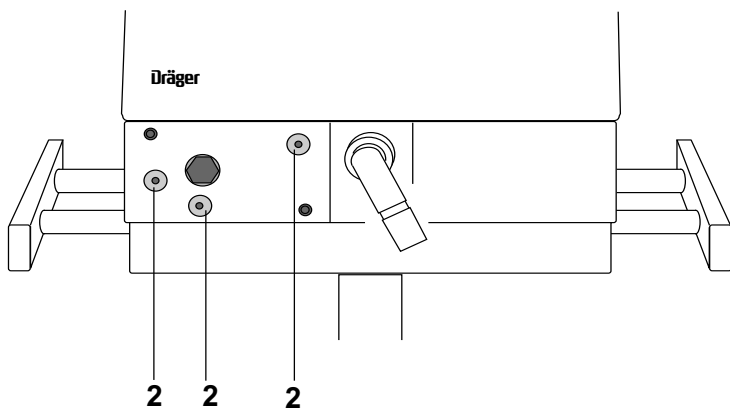
#### 4 Replacing the Lip Seals Every 2 Years

- Lift the toggle **1** and take out the expiratory valve.



**Fig. 4:** Removing the Expiratory Valve

- Use, for example, a spherical-head 2.5 mm screwdriver to remove the old lip seals **2**. Insert the new lip seals and make sure they fit properly.

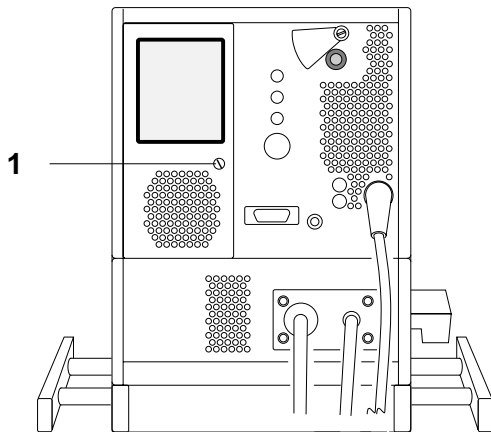


**Fig. 5:** Location of the Lip Seals

- Re-mount the expiratory valve. To do so, lift up the toggle and place the expiratory valve to the front using the guide rods.
- Lock the expiratory valve with the toggle **1**.

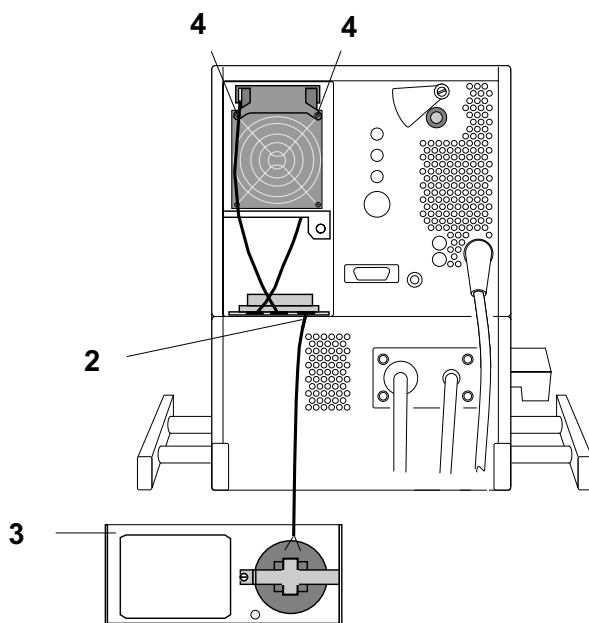
## 5 Replacing the NiCd Battery (Power Failure Alarm) Every 2 Years

- Remove the screw **1** on the fan/loudspeaker cover.



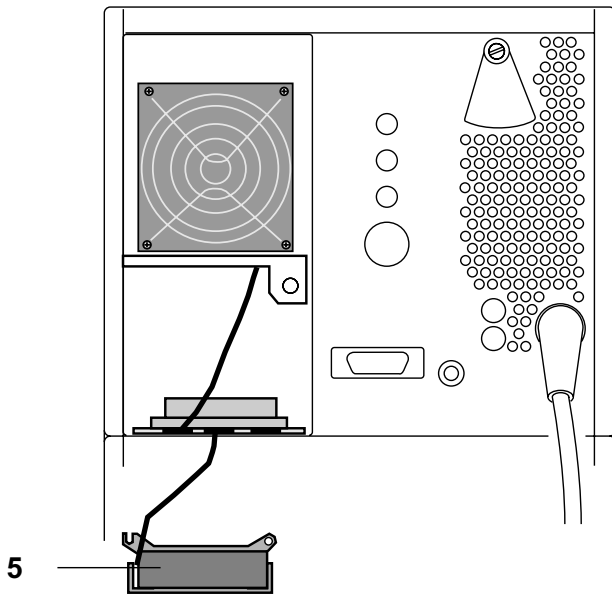
**Fig. 6:** Opening the Loudspeaker Cover

- Gently lower the cover **3**.
- Disconnect the cable connection **2** and place the cover **3** aside.
- Remove the screws **4** on the battery mount.



**Fig. 7:** Removing the Loudspeaker Cover

- Remove the battery 5 and install a new one.



**Fig. 8:** Replacing the Battery

- Re-assemble the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC. The battery for power failure alarm is recharged automatically during operation.

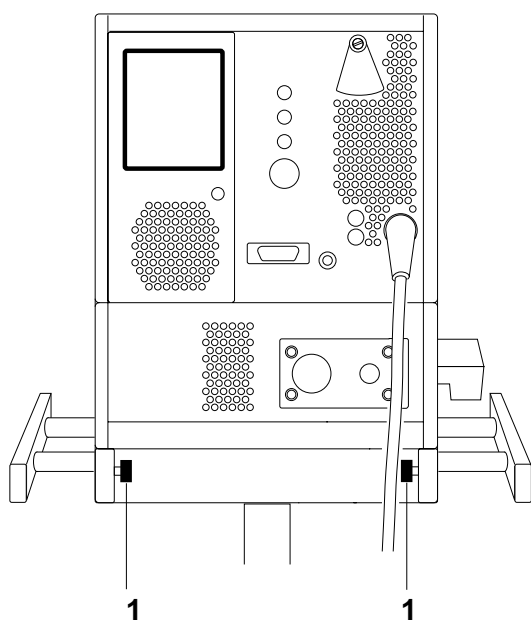
After replacing the battery, allow the device to operate for at least half an hour in order to sufficiently charge the battery.



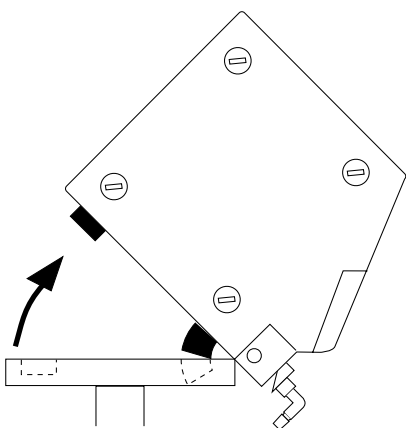
**No acoustic alarm will sound in the event of power failure if the battery is not sufficiently charged. Risk of severe injury or death. Allow the device to operate for at least half an before clinical application.**

## 6 Replacing the Pressure Reducer Every 6 Years

- Disconnect the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC from the mains supply.
- Disconnect the gas supply hoses from the central gas supply/gas cylinder.
- Disengage the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC from the trolley. To do so, loosen the knurled nuts **1** on the rear panel.



**Fig. 9:** Location of the Knurled Nuts



**Fig. 10:** Disengaging the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC

- Remove the screws **2** from the two side panels.

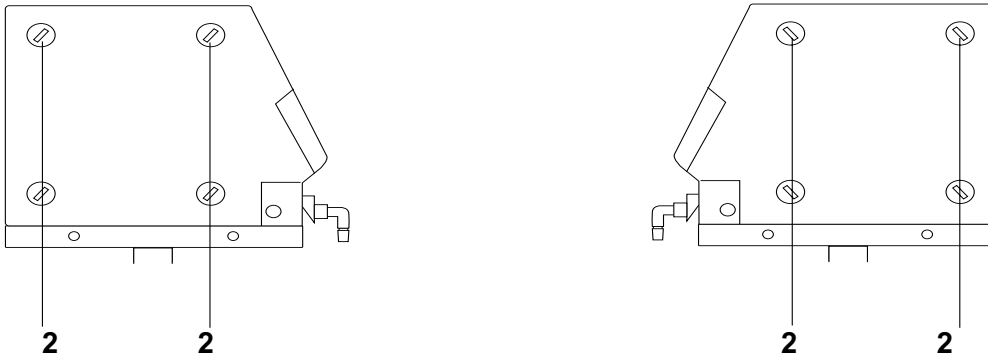


Fig. 11: Left and Right Panel

- Remove the bottom screws **3** from the fixing straps on the left and right panel.

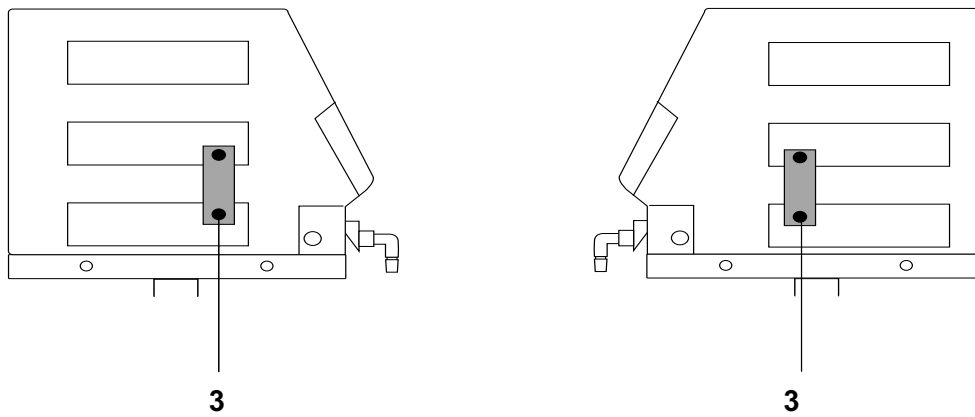
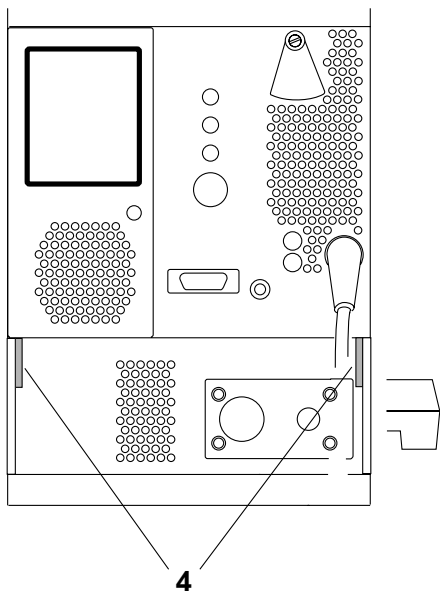


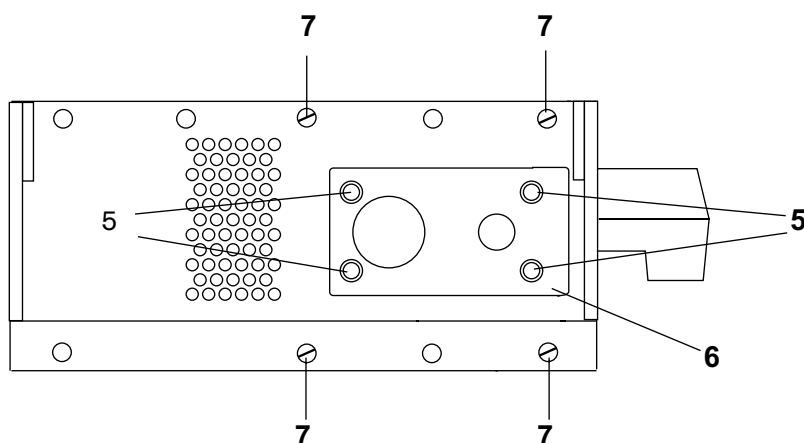
Fig. 12: Removing the Fixing Straps

- Remove the bottom screws **4** from the fixing straps on the rear panel.



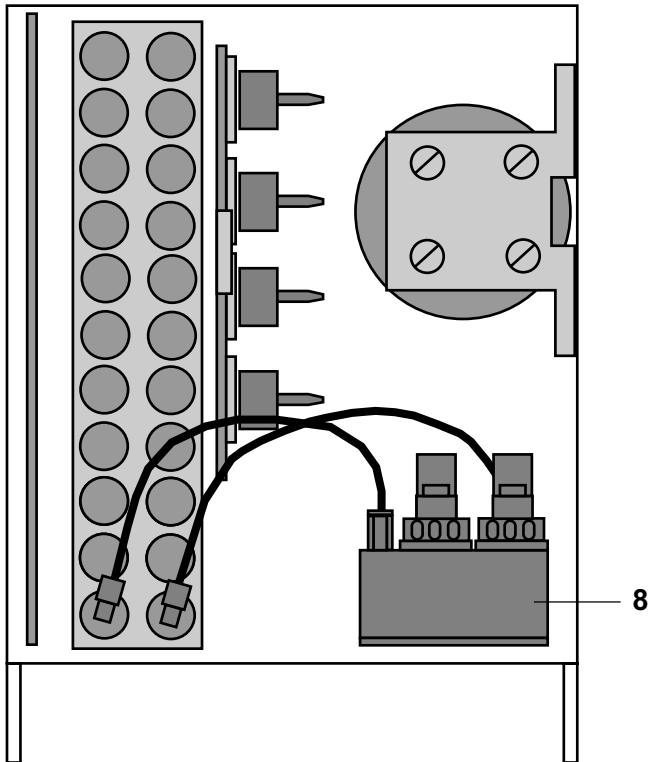
**Fig. 13:** Rear Panel of the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC

- Gently lift the top part and place it next to the bottom part.
- Remove the screws **5**.
- Remove the gas supply connection plate **6**.
- Remove the two filters and the gasket. Loosen the screws **7** on the supply block.



**Fig. 14:** Supply Block

- Slightly tilt the supply block **8**. Make sure not to damage the hoses or the printed circuit boards.



**Fig. 15:** Pneumatic Assembly of the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC



**Tilting the supply block excessively will cause damage to the hoses and/or printed circuit boards. Do not tilt the supply block more than necessary.**



- Remove the fastening screws **9** from the pressure reducers.
- Pull out the pressure reducers.

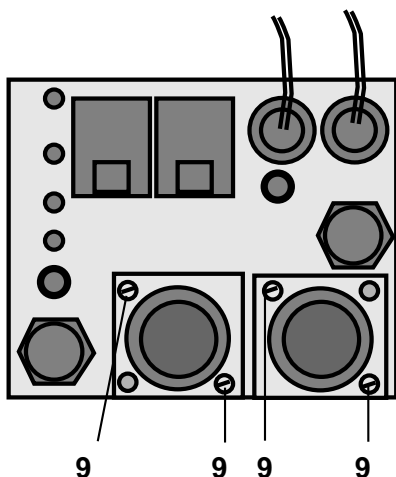


Fig. 16: Supply Block

- Replace the pressure reducers **10** for AIR and O<sub>2</sub> including the O-rings **11** (part number D19080) and **12** (part number M23154).

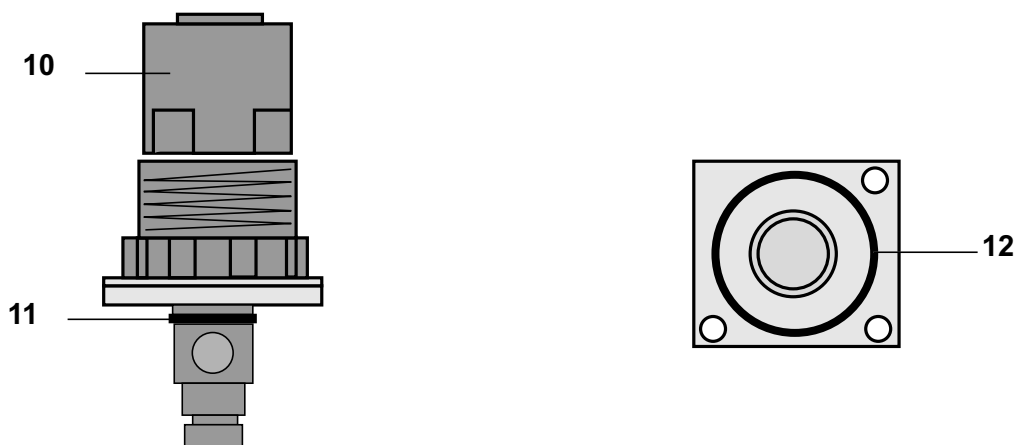
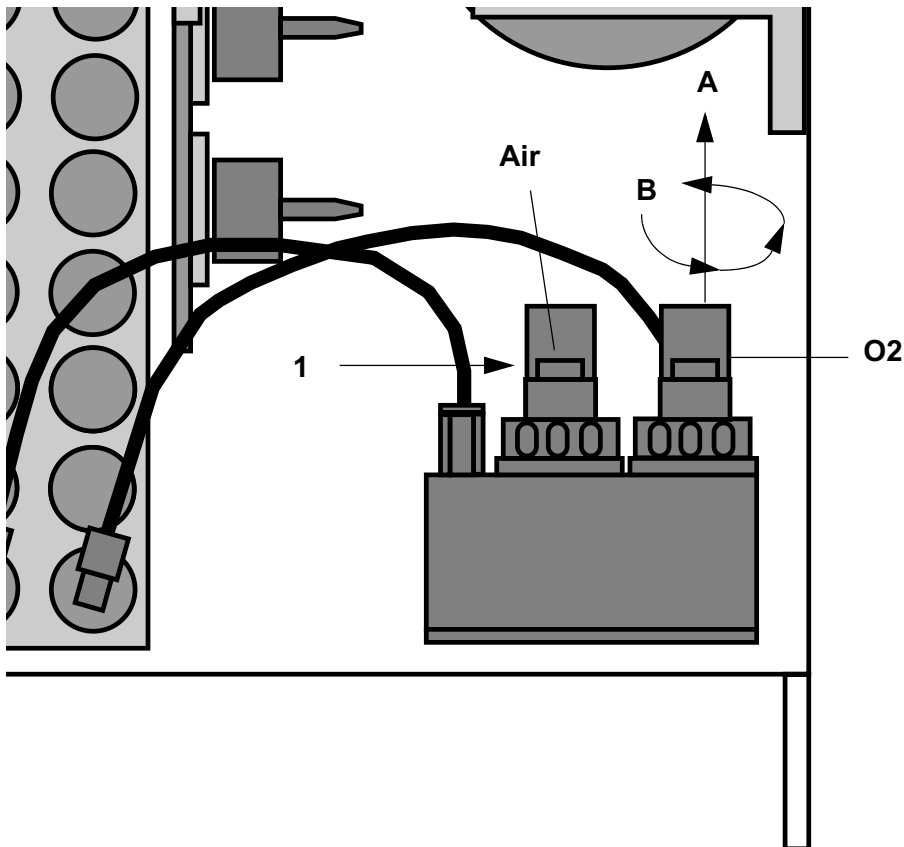


Fig. 17: Pressure Reducers

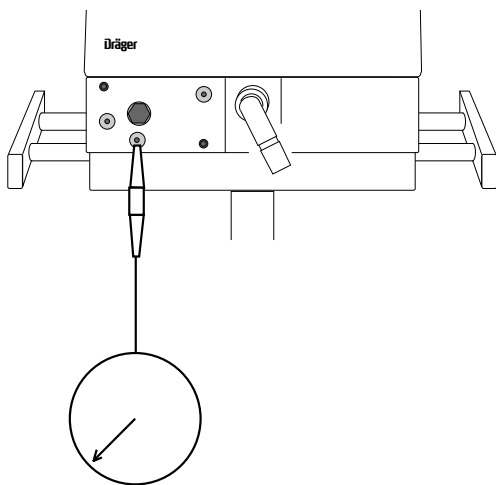
- Mount the pressure reducers onto the supply block.
- Mount the supply block.
- Re-insert the gasket and the filters (wire fabric side shows towards inside).
- Mount the gas supply connection plate.

- Unlock the pressure reducers by pulling the adjusting rings **1** in direction of **A**.
- Turn the adjusting rings **1** counterclockwise in direction of **B** as far as they will go (pressure reducers will be closed).



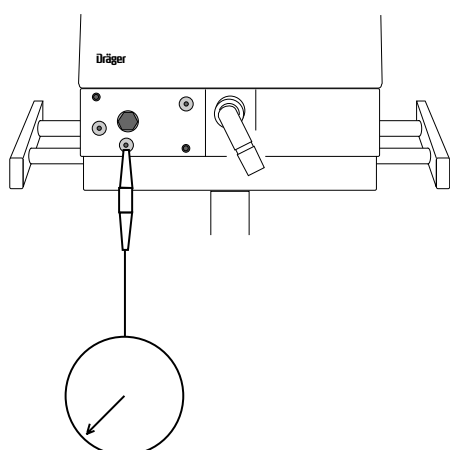
**Fig. 18:** Pneumatic Assembly

- Connect to the air supply only and switch on the Babylog 8000/ Babylog 8000 plus/Babylog 8000 SC.
- Adjust the following parameters:  
Mode = CPAP; PEEP/CPAP adjuster = 0 mbar; insp. flow = 1 L/min



**Fig. 19: Air-Supply Test Set-Up**

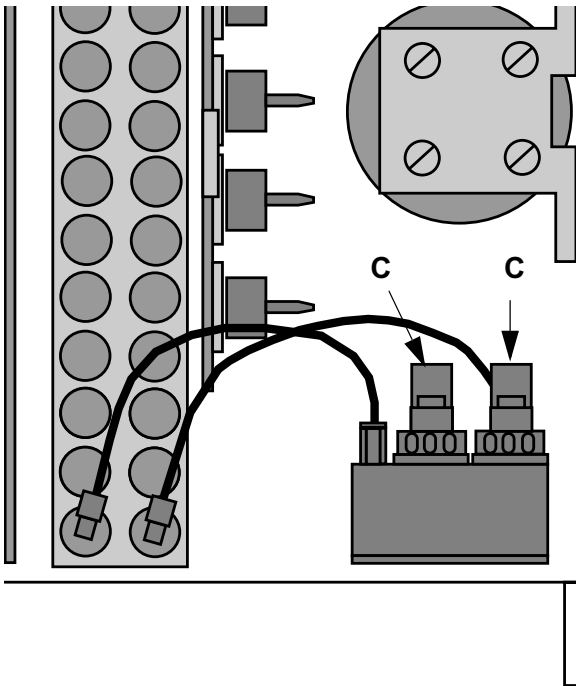
- Carry out the measurement with a manometer and a secretion sightglass at the pneumatics outlet.
- Slowly turn the adjusting ring of the air pressure reducer clockwise. The message “no compressed air” on the LCD disappears.
- Set the pressure reducer to 1.7<sup>-0.1</sup> bar.
- Set the insp. flow adjuster to 30 L/min. The manometer should indicate at least 1.3 bar.
- Disconnect the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC from the air supply and connect it to the oxygen supply.
- Adjust the following parameters:  
Mode = CPAP; PEEP/CPAP adjuster = 0 mbar; insp. flow = 1 L/min.



**Fig. 20: O<sub>2</sub>-Supply Test Set-Up**

- Carry out the measurement with a manometer and a secretion sightglass at the pneumatics outlet.
- Slowly turn the adjusting ring of the O<sub>2</sub> pressure reducer clockwise. The message “no oxygen” on the LCD disappears.

- Set the pressure reducer to 1.7 <sup>-0.1</sup> bar.
- Set the insp. flow adjuster to 30 L/min. The manometer should indicate at least 1.3 bar.
- Lock both adjusting rings by pressing them in direction of the arrows **C**.
- Make sure that the hose system is free of leaks.



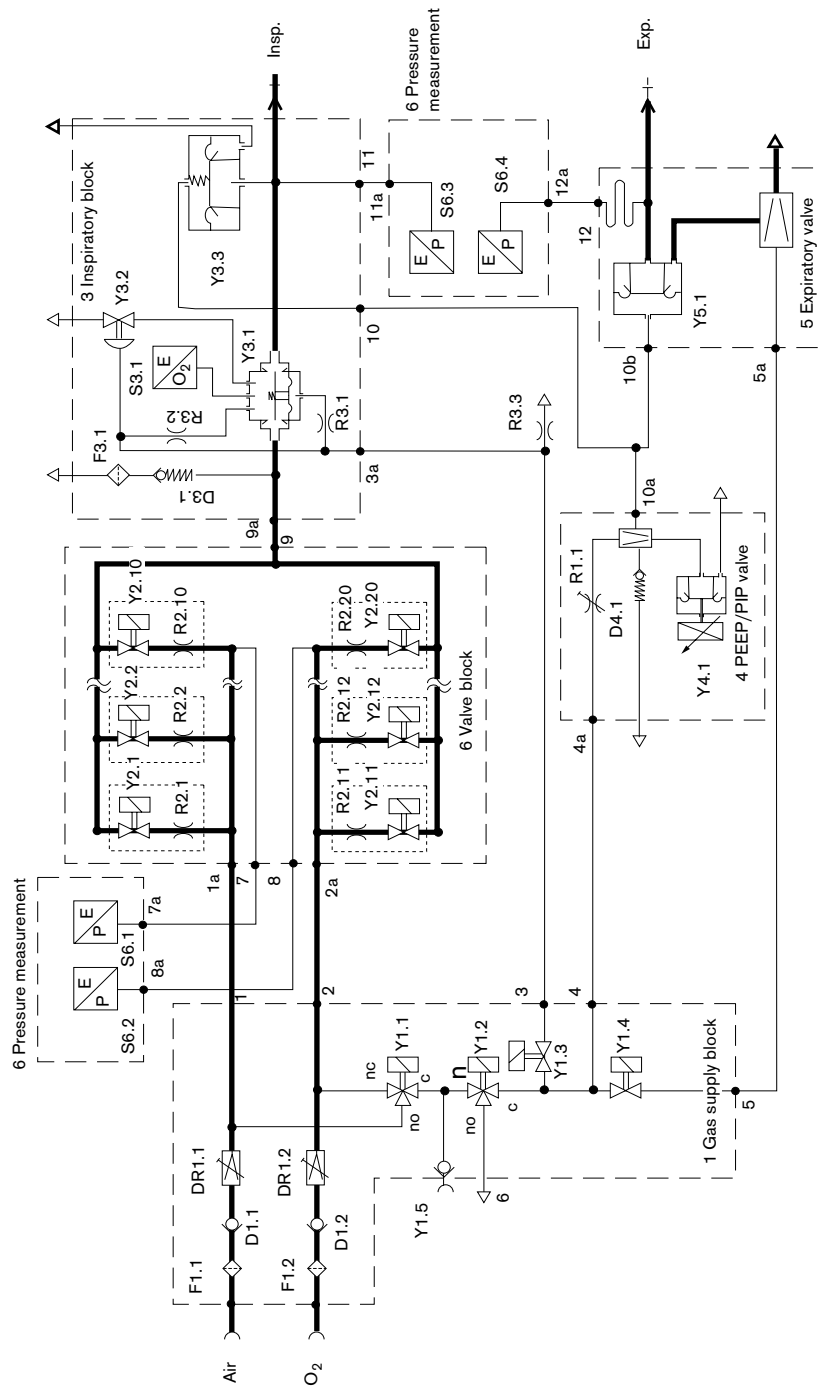
**Fig.21:** Locking the Pressure Reducer

- Re-assemble the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC and return it to service ready-for-use.

# Schematics and diagrams



1 Schematics and Diagrams



**Version 0 valid up to serial no. ARDK (Sep. 91)**  
 incl. spring (25 mbar in Y 3.3)  
 incl. pressure limiting valve (85 mbar) in PEEP/PIP valve,

Fig. 1: Function Diagram of Babylog 8000 „Version 0“

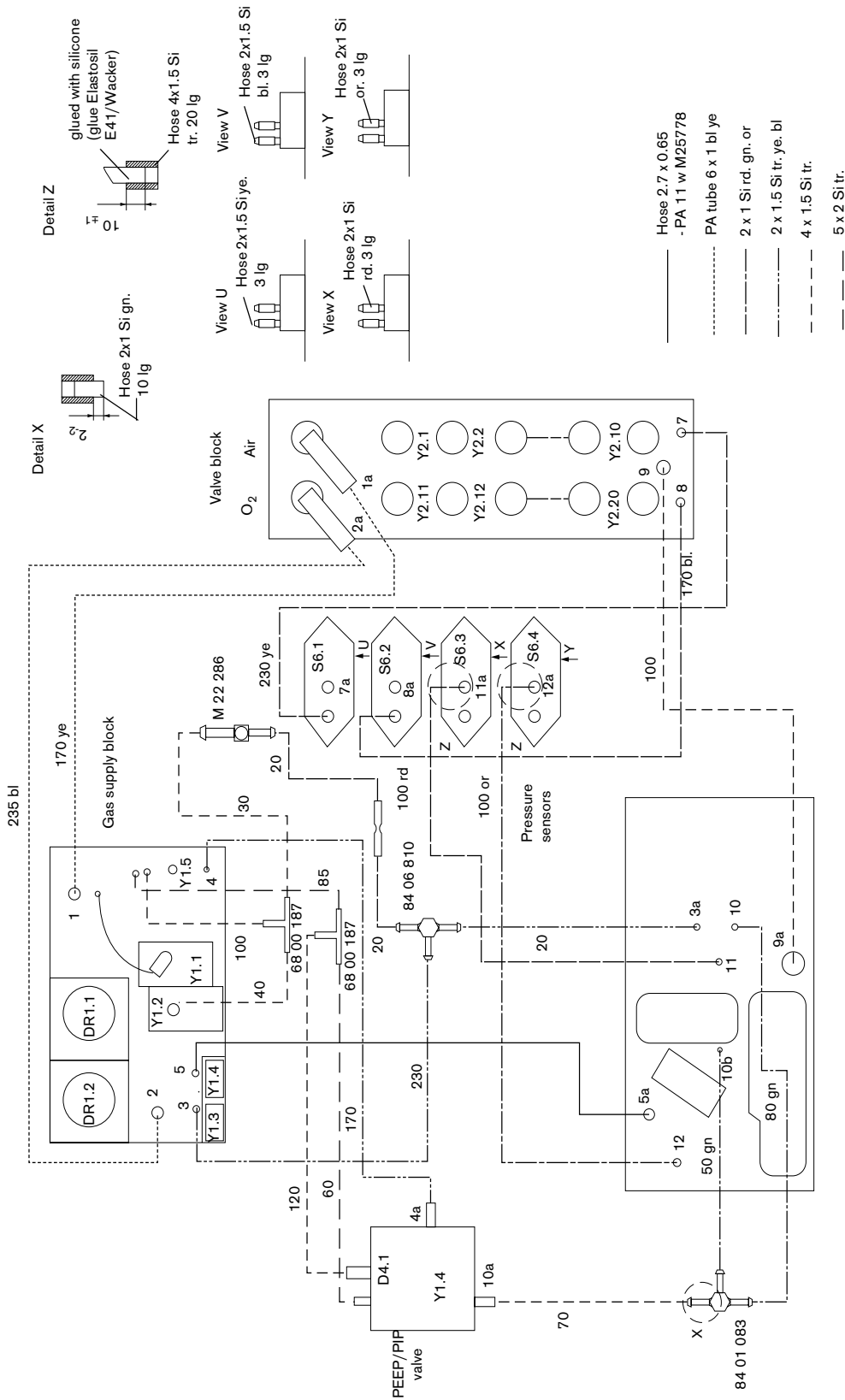
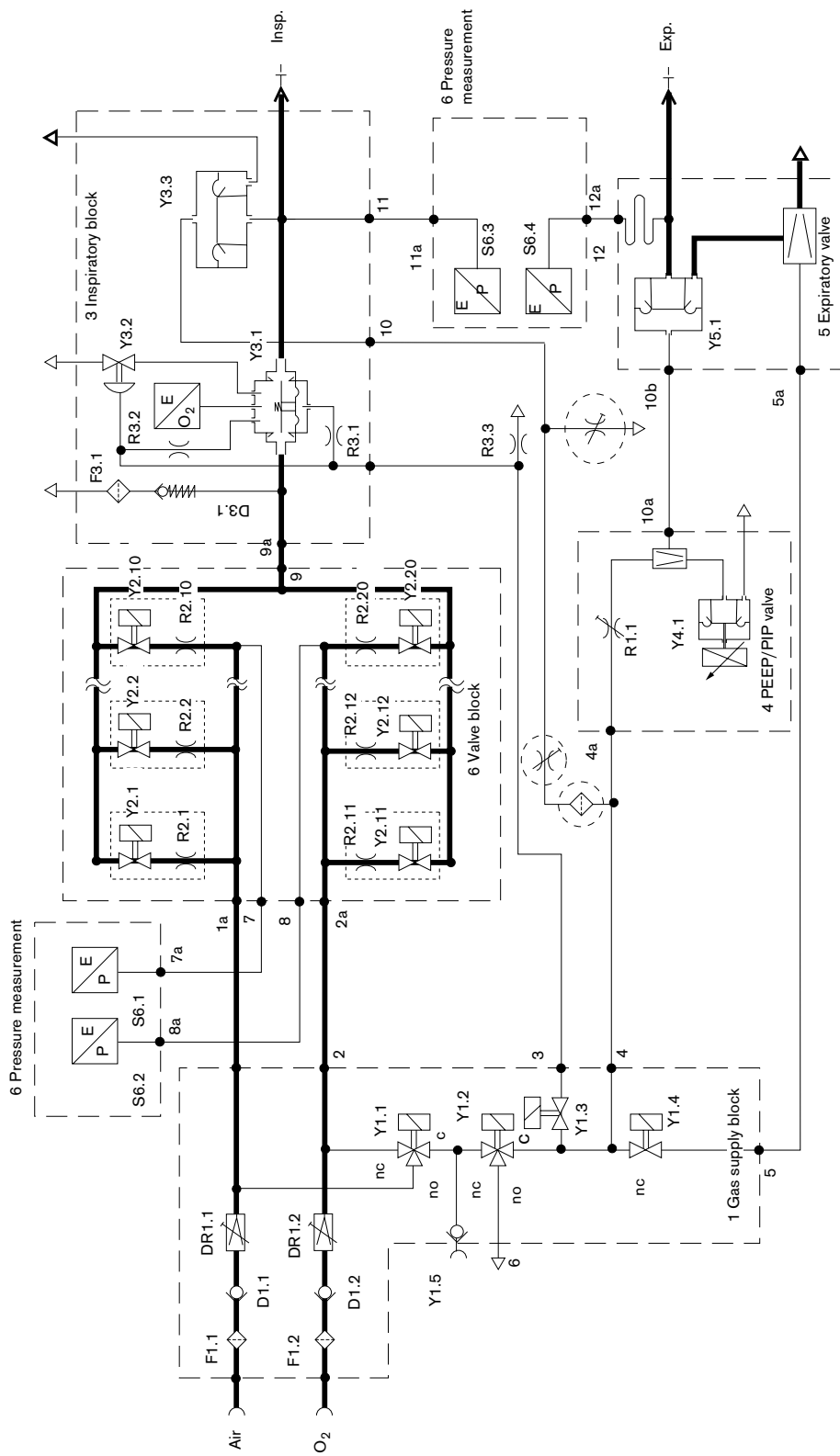


Fig. 2: Tubing Diagram of Babylog 8000 „Version 0“





**Version 1 up to ARDL (Oct. 91)**  
 without spring (25 mbar in valve Y 3.3  
 without Pressure limiting valve (85 mbar) at

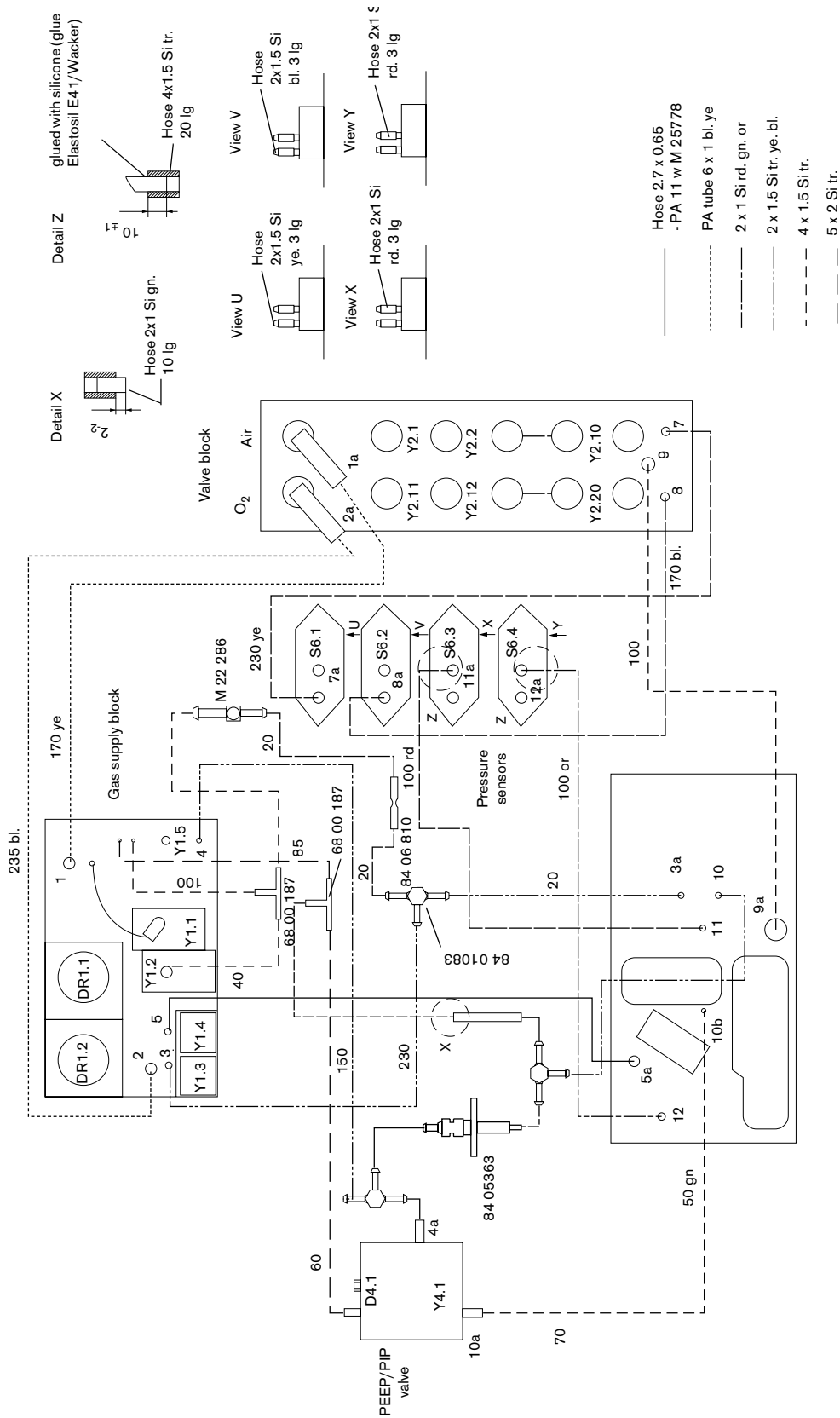
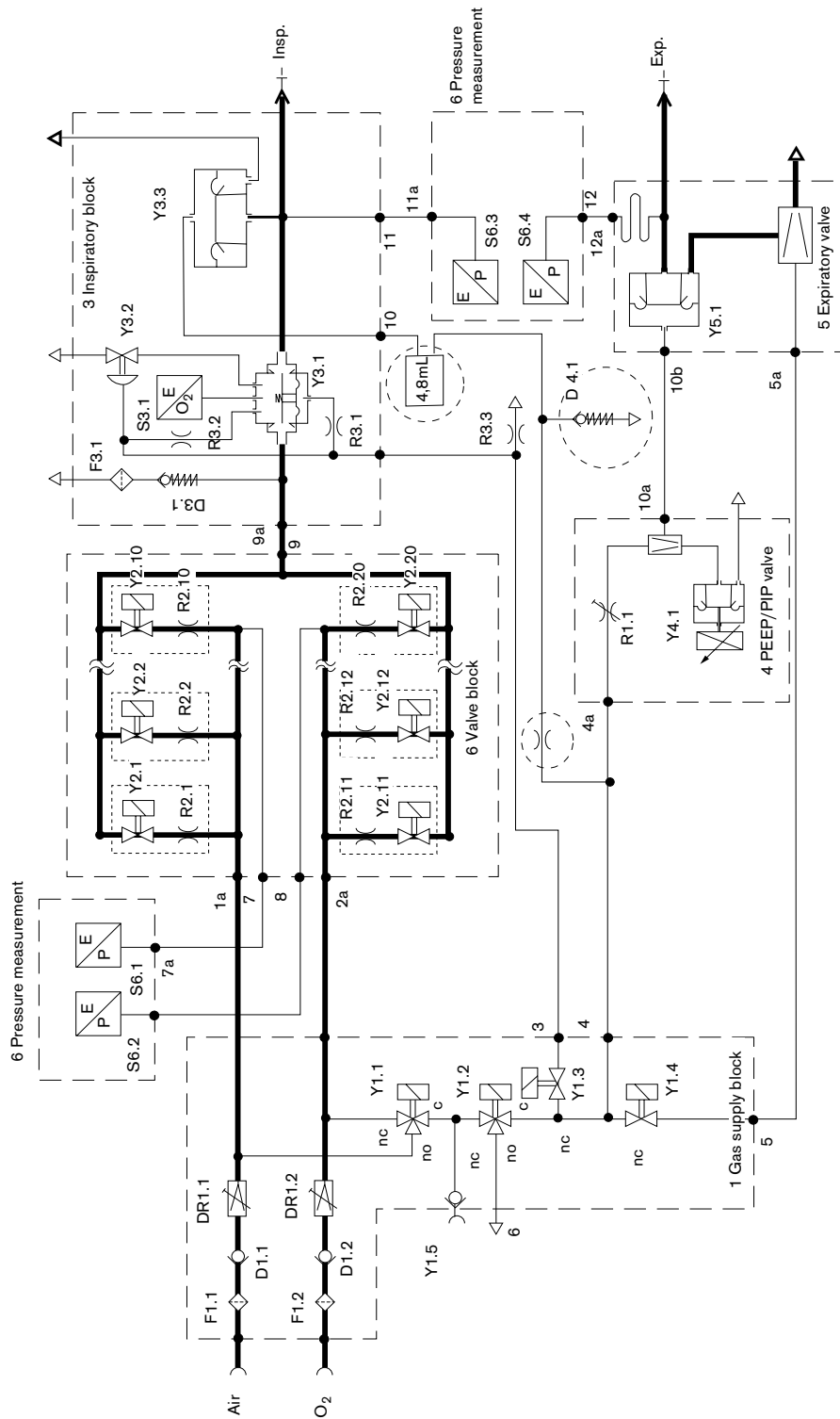


Fig. 4: Tubing Diagram of Babylog 8000 „Version 1“



**Version 2 (as of 1992)**  
 without spring (25 mbar in valve Y 3.3)  
 without Pressure limiting valve (85 mbar) in  
 PEEP valve

**Fig. 5:** Function Diagram of Babylog 8000 „Version 2“

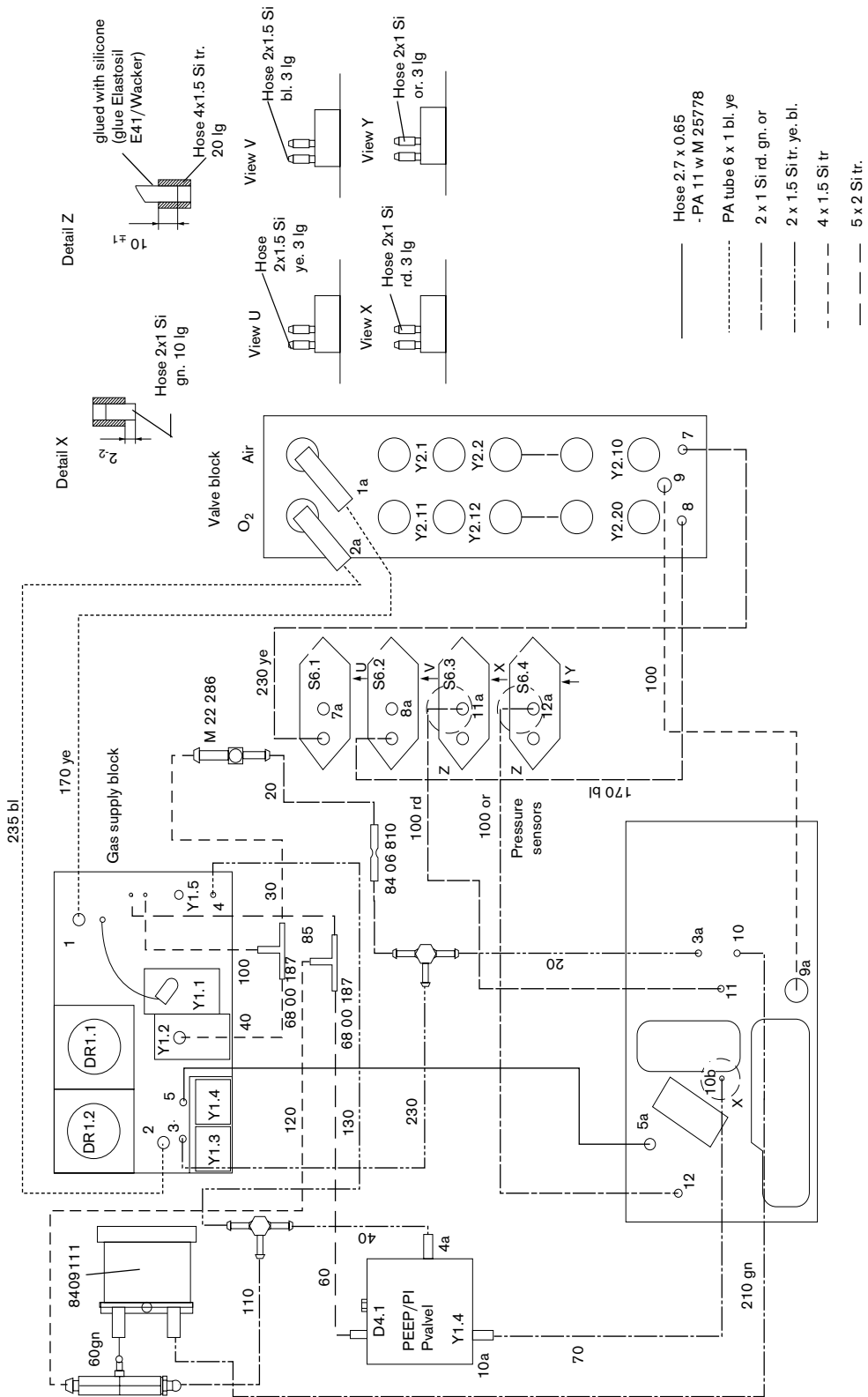
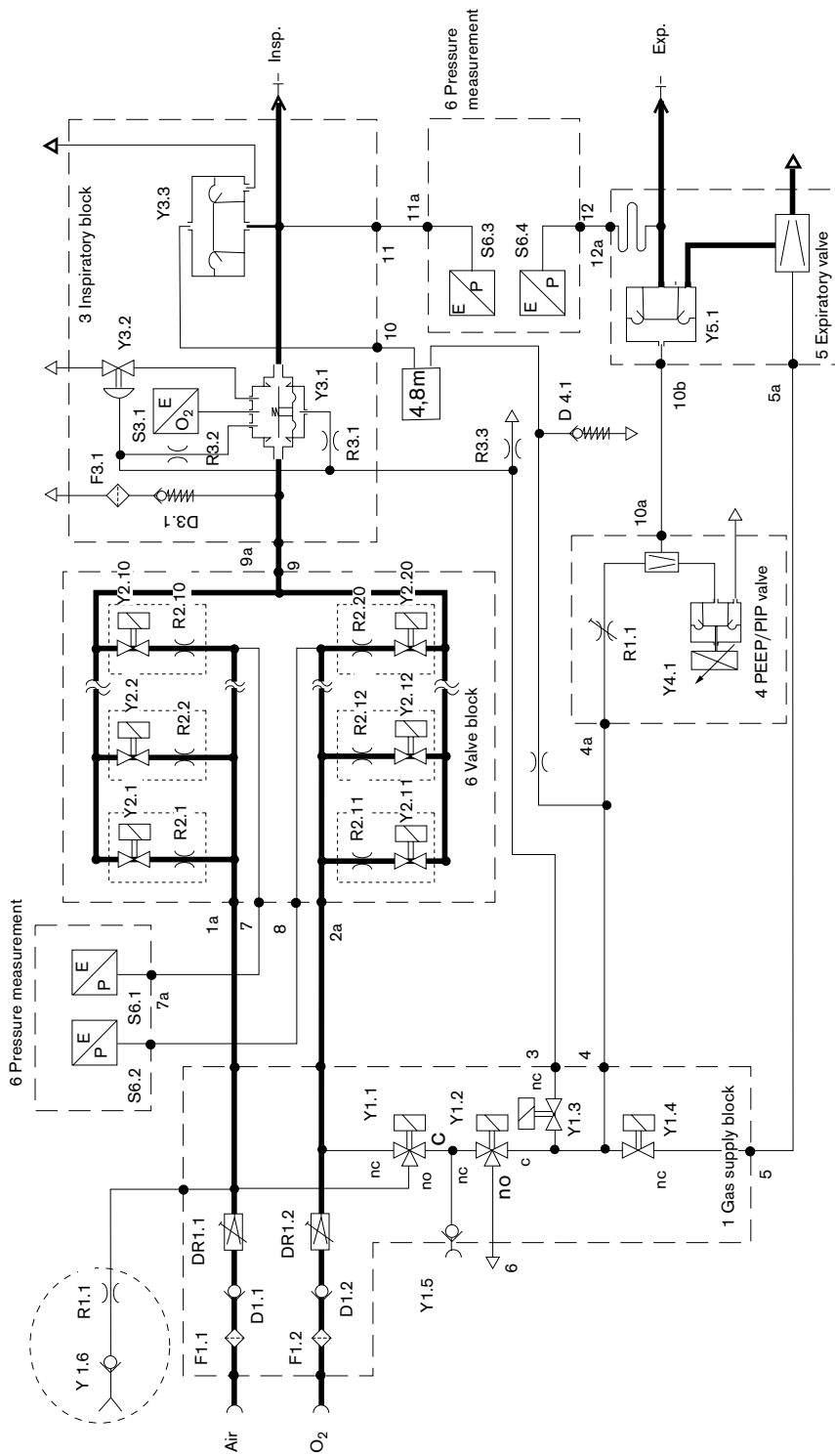


Fig. 6: Tubing Diagram of Babylog 8000 „Version 2“



**Version 3 (same as Version 2 + a nebulizer)**  
 A nebulizer can be retrofitted in Versions 0, 1 and 2.

**Fig. 7:** Function Diagram of Babylog 8000/Babylog 8000 SC „Version 3“

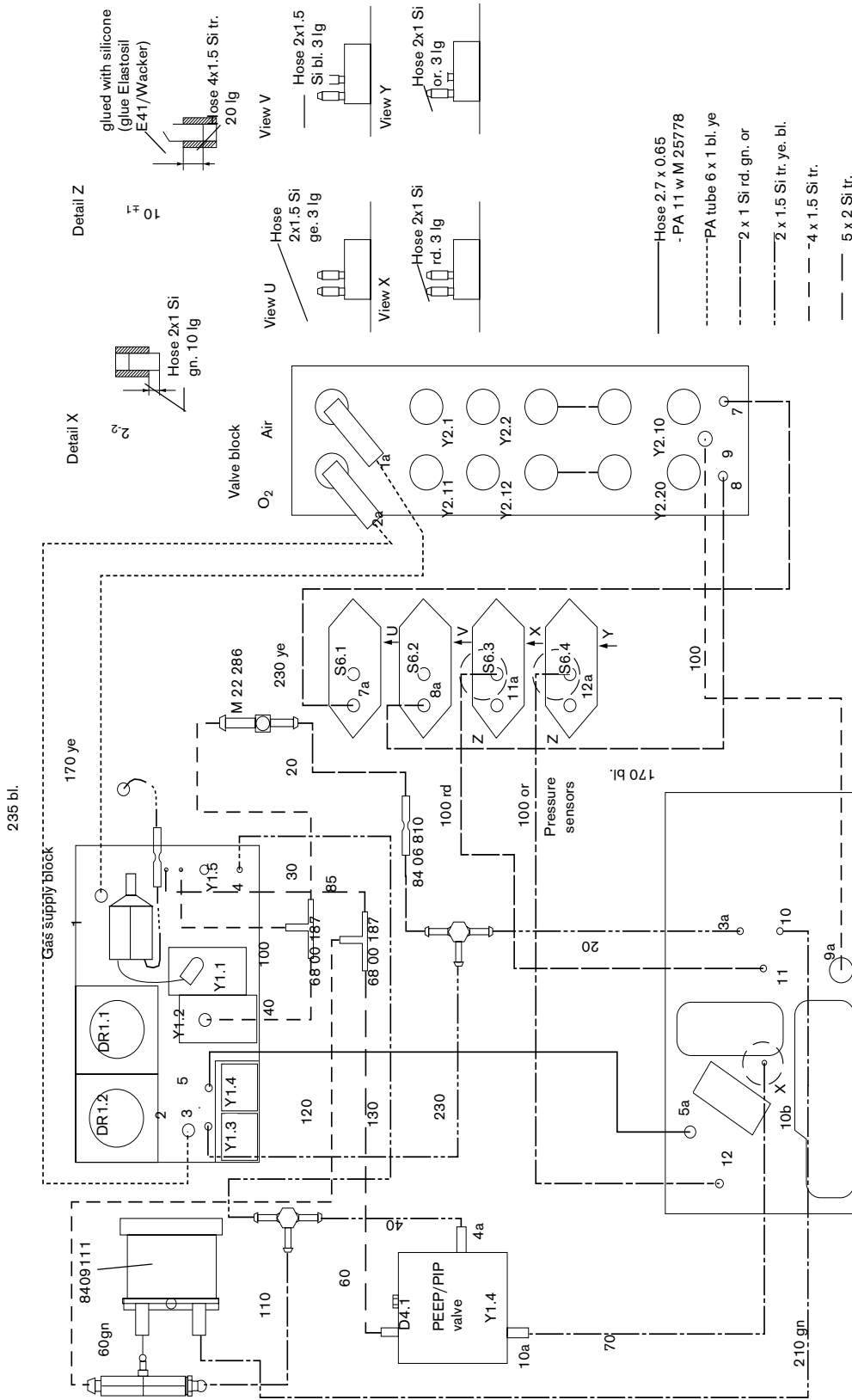
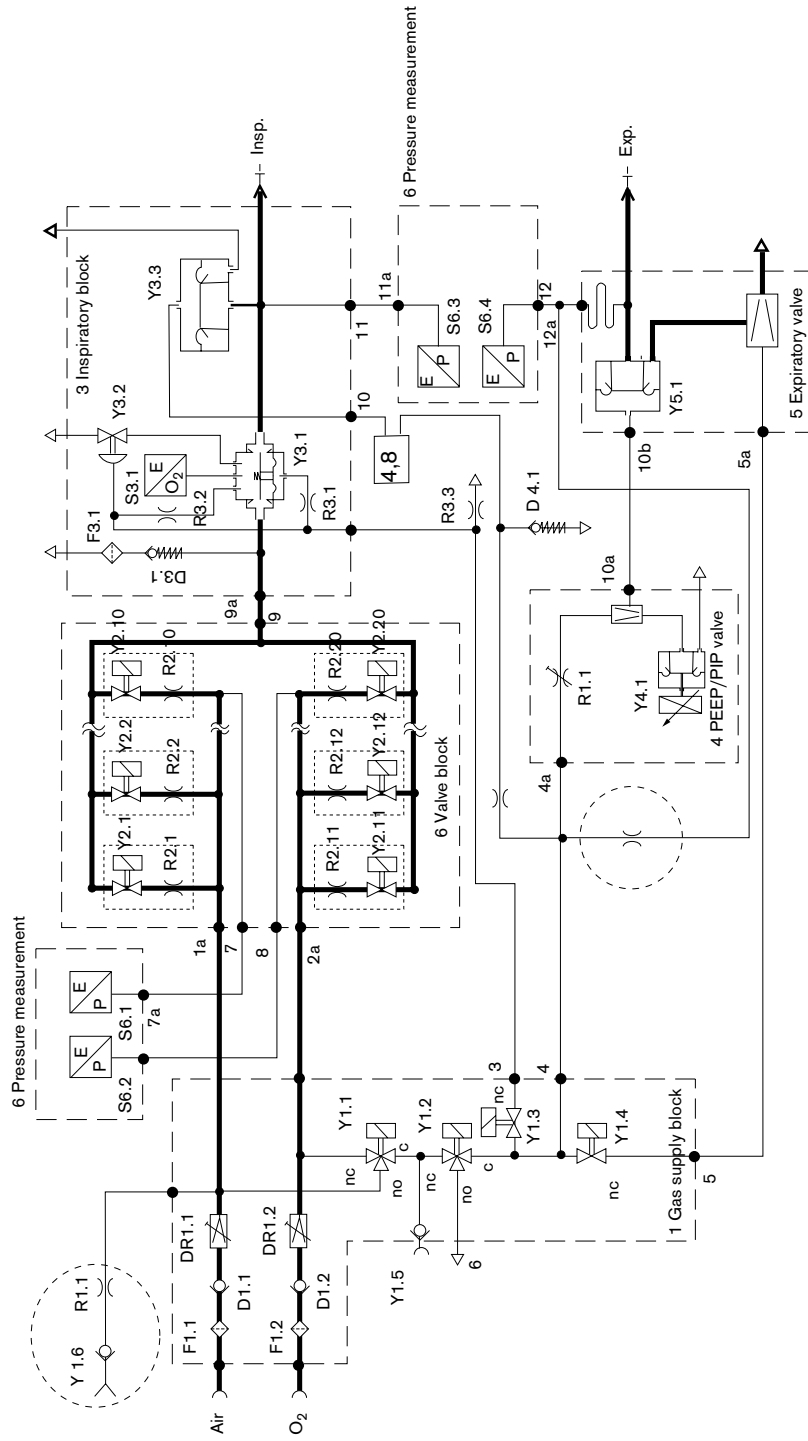


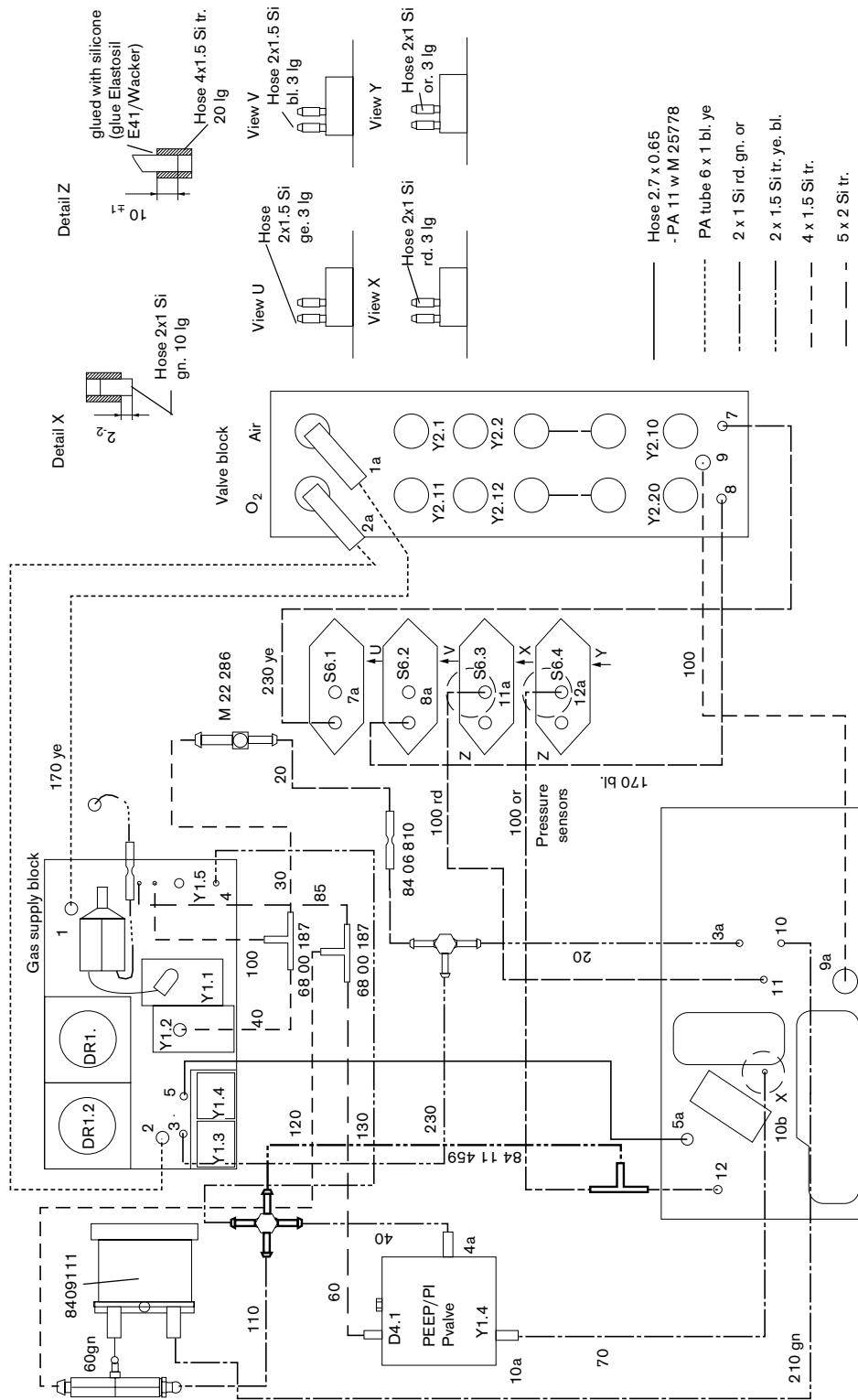
Fig. 8: Tubing Diagram of Babylog 8000/Babylog 8000 SC „Version 3“



Version 3 (same as Version 2 + a nebulizer) with conversion kit "purge flow"

**Fig. 9:** Function Diagram of Babylog 8000/Babylog 8000 SC „Version 3“ with conversion kit „purge flow“

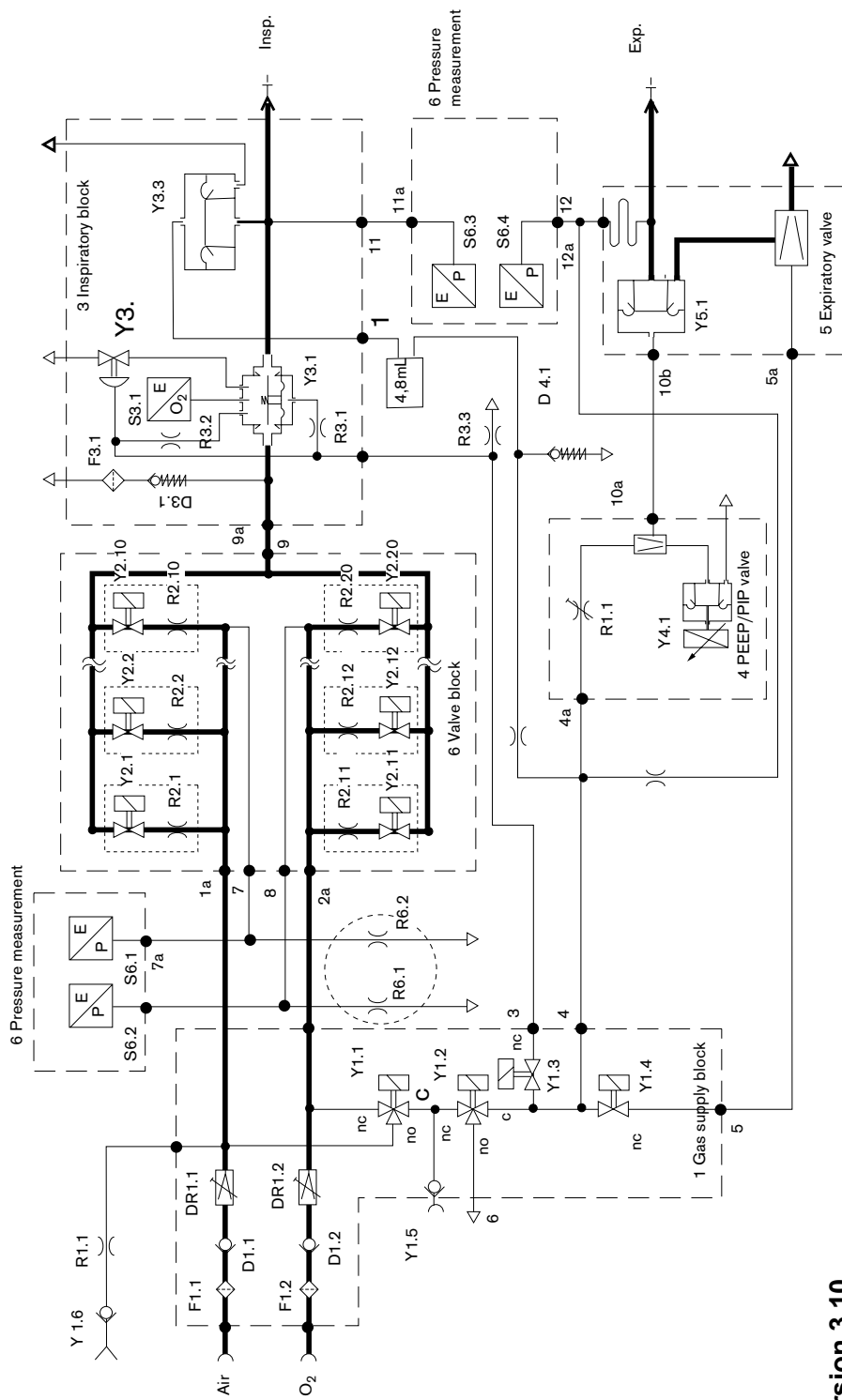
**Important:** This conversion kit is only necessary when pressure measuring problems occur in the HFV mode while the Aquamod is connected.



**Fig. 10:** Tubing Diagram of Babylog 8000/ Babylog 8000 SC (Version 3 with conversion kit „purge flow“)

The restrictor for the purge flow is integrated in the silicone hose (84 11 459)





**Version 3.10**  
Version 3.10 with leakage compensation (avoids a subsequent

**Fig. 11:** Function Diagram of Babylog 8000/Babylog 8000 plus/Babylog 8000 SC „Version 3.10“

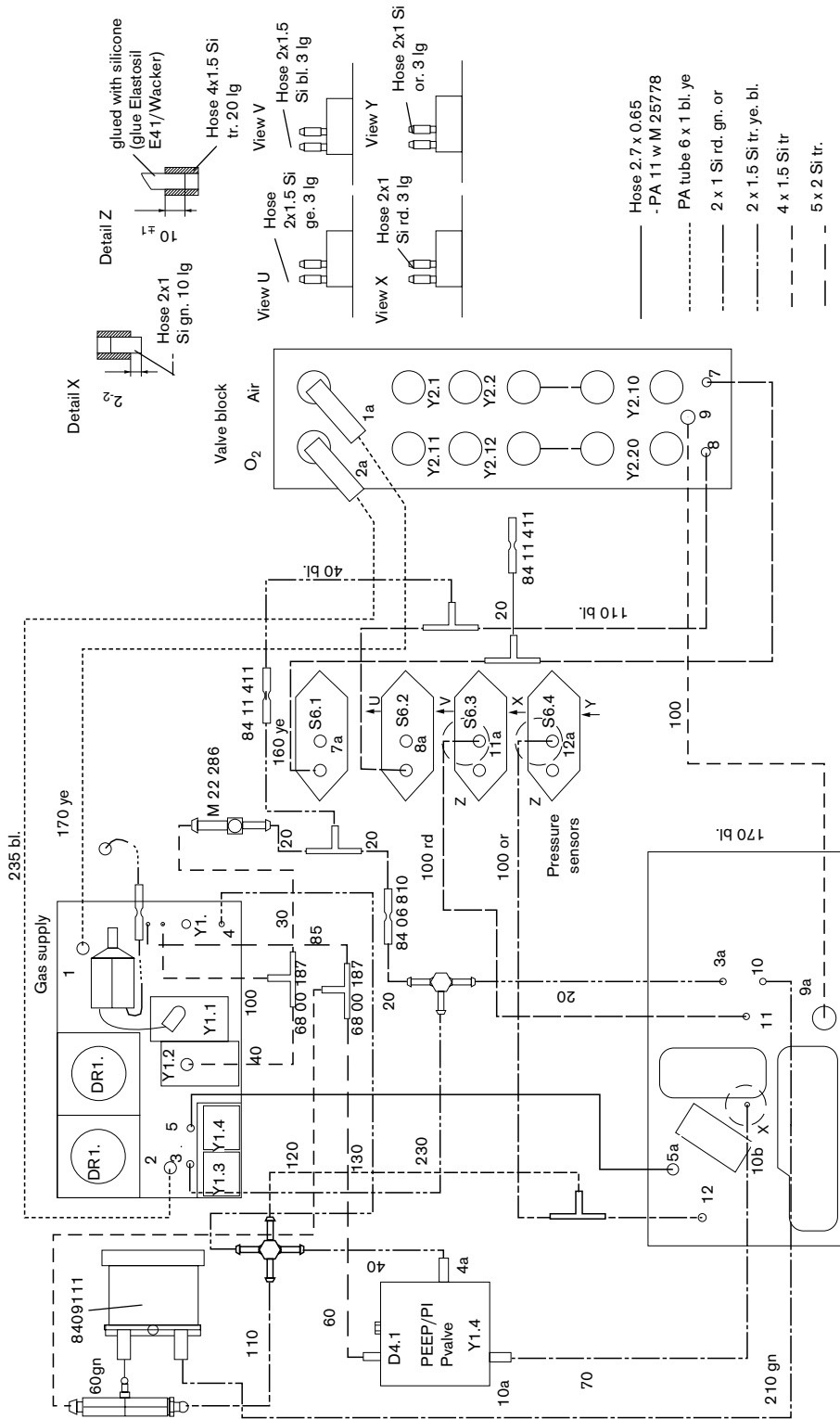


Fig. 12: Tubing Diagram of Babylog 8000/Babylog 8000 plus/Babylog 8000 SC „Version 3.10“

## Error List



## 1 Error messages

If the system detects a hardware or software error, it displays an error number on the LC display.

The error numbers are subdivided into the following ranges:

Number	Range
000 to 999	CPU PCB 68000
100 to 199	Flow PCB
200 to 299	Monitoring PCB
300 to 399	I/O PCB
400 to 499	Communication PCB
500 to 599	CPU PCB 68000
600 to 699	Flow PCB
700 to 799	Monitoring PCB
800 to 899	Errors detected by the Monitoring PCB. If this error occurs, partly more detailed error numbers are displayed on the 7-segment display of the Monitoring PCB.

## 2 List of device error messages



If an error occurs, read the Babylog 8000/8000 SC error messages on the 7-segment display of the Monitoring PCB!

**Table 1: Device error messages**


Display error number	Monitoring PCB error number	Meaning
000		CPU PCB ROM error
001		CPU PCB RAM error
002		One or more keys jammed (continuously pressed).
003		Data transmission between CPU PCB and the dual-port RAM of the Monitoring PCB is interfered.
004		Watchdog error or CPU PCB reset
005		CPU PCB error: The CPU PCB is in the boot phase although the Monitoring PCB is running in the background (e.g. by a CPU PCB reset).
006		Vector error or CPU PCB reset
500		Software error: Incorrect operating mode, for example, error in storage of operational data in the time-keeper RAM on the CPU PCB.
501		Monitoring PCB does not function correctly
502		Flow PCB does not function correctly
503		CPU PCB software error: Impermissible breathing phase
504		CPU PCB software error

Table 1: Device error messages










Display error number	Monitoring PCB error number	Meaning
505		CPU PCB software error
506 to 513		CPU PCB software error.
800		FiO <sub>2</sub> too high by more than 10 vol.%.
801		FiO <sub>2</sub> too low by more than 10 vol.%.
802		FiO <sub>2</sub> measurement deviation between master (CPU PCB and I/O PCB) and Monitoring PCB is too high.
803		Measured P <sub>insp</sub> to potentiometer setting P <sub>insp</sub> too high by more than 25 mbar (cmH <sub>2</sub> O).
804		P <sub>insp</sub> greater than 110 mbar (cmH <sub>2</sub> O).
805		P <sub>insp</sub> less than -5 mbar (cmH <sub>2</sub> O)
806		Flow measurement on the Flow PCB is faulty
807		Potentiometer evaluation is faulty: Master (CPU PCB and Frontcontroller PCB) and Monitoring PCB read different values.
809		Battery or battery charge faulty (battery voltage < 7 V)

Table 1: Device error messages











Display error number	Monitoring PCB error number	Meaning
810		Mains switch auxiliary contact is faulty, (battery voltage > 12 V)
811		Safety relay on the Pneumatic Control PCB is faulty.
		During the boot sequence, master CPU PCB and Monitoring PCB do not run synchronously.
813		Valves driver monitoring on the Pneumatic Analog PCB faulty. Applies to software versions 3.n and 4.n only: Air and O <sub>2</sub> pressure supplies are not connected upon power-on.
815		+27 V voltage supply is faulty.
816		Valve drive is faulty.
817		Loudspeaker or feedback is faulty.
818		Babylog 8000/8000 SC device temperature is too high.
819		Temperature measurement is faulty.
820		+15 V comparator is faulty.



Table 1: Device error messages


















Display error number	Monitoring PCB error number	Meaning
		-15 V comparator is faulty.
		+5 V comparator is faulty.
		+27 V comparator is faulty.
822		O <sub>2</sub> calibration sequence is faulty.
823		The CPU PCB is not functioning properly, according to the Monitoring PCB.
824		Timer in time-keeper RAM on the CPU PCB is faulty.
825		Power pack is faulty, +15 V error.
		Power pack is faulty, -15 V error.
		Power pack is faulty, +5 V error.
		Power pack is faulty, +27 V error.
		The Monitoring PCB is faulty.

Table 1: Device error messages

Display error number	Monitoring PCB error number	Meaning
		RAM on Monitoring PCB is faulty.
		ROM on Monitoring PCB is faulty.
		Powerfail from the power pack.
		Watchdog test on Monitoring PCB after power-on.
		Watchdog test on Monitoring PCB completed.
		Master (CPU PCB) did not start after the Babylog 8000/8000 SC start.

# **Annex**

**Spare parts list**

**Test List**

**Technical Information according to EMC standard IEC/EN 60601-1-2:2001**



# Spare parts catalogue

Babylog 8000

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8409200	Babylog 8000 d/e 220/240V	1.000	St	00000000	
	8410270	Babylog 8000, franz.	1.000	St	00000000	
	8410280	Babylog 8000, USA	1.000	St	00000000	
	8410564	Babylog 8000, Japan	1.000	St	00000000	
	8411111	Babylog 8000, Kanada	1.000	St	00000000	

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	8305367	FILTER MAT	1.000	St	29991231		

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8410813	SCHLAUCHSET AQUAMOD	1.000	St	00000000	
	8411148	SCHLAUCHSET AQUAMOD HFV	1.000	St	00000000	
	2M85337	COMPACT RAIL	1.000	St	00000000	
	8410718	WANDKONSOLE BABYLOG 8000	1.000	St	00000000	
	2M19460	AUFNAHMEPLATTE	1.000	St	00000000	
	8409609	HINGED ARM 240-DEGR.	1.000	St	00000000	
	8411075	SCHLAUCHHALTER	1.000	St	00000000	
	8410565	AQUAMOD 100V	1.000	St	20051231	
	8410600	Anfeuchtermodul	1.000	St	00000000	
	8410535	MODULHALTER F.INKUBATOR 8000	1.000	St	00000000	
	8410536	Modulhalter	1.000	St	00000000	
	M29239	AIR-CONNECTING HOSE 3M	1.000	St	00000000	
	M29259	AIR-CONNECTING HOSE 5M	1.000	St	00000000	
	8410250	AQUAMOD 220-240 V	1.000	St	00000000	



Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	M29231	O2-CONNECTION HOSE 3M	1.000	St	00000000		3m blue
	M29251	O2-CONNECTING HOSE 5M	1.000	St	00000000		

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8407475	PEEP-Valve (Ambu-PEEP)	1.000	St	00000000	
	2105438	SAUERSTOFFSCHLAUCH(1190520) RE	1.000	St	20001231	
	8409738	KONDENSATABSCHEIDER (IN/EX)	1.000	St	00000000	
	8411025	RUESTSATZ	1.000	St	00000000	
	8411023	KUPPLUNG	1.000	St	00000000	
	8405752	CONE 22A	1.000	St	29991231	
	M19351	KONNEKTOR F.TRACHEALTUB.11	1.000	St	00000000	
	8411024	Dichtstopfen	1.000	St	00000000	
	8405000	MEDICAMENT NEBULIZER (PNEU)	1.000	St	20051231	
	2120941	Baby-Resutator 2000	1.000	St	00000000	

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

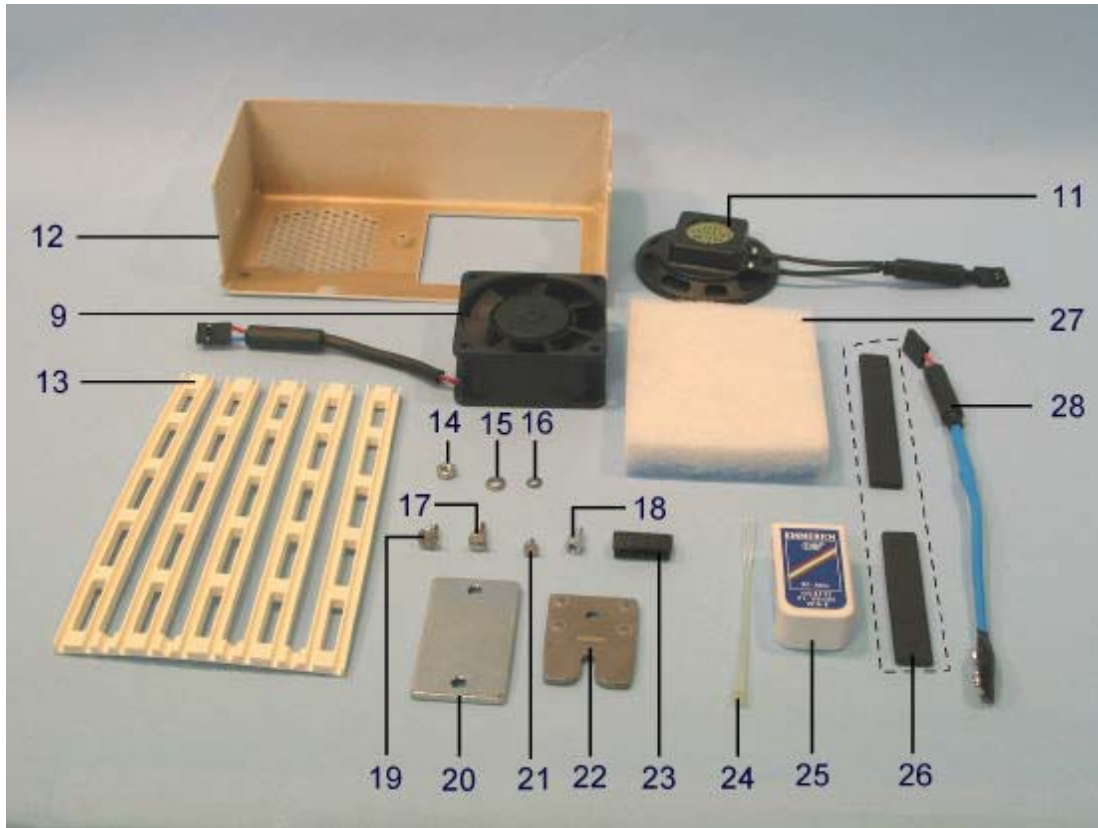
Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	8410813	SCHLAUCHSET AQUAMOD	1.000	St	00000000		
	8411148	SCHLAUCHSET AQUAMOD HFV	1.000	St	00000000		
	8408950	EXSP.-Ventil Babylog 8000	1.000	St	00000000		
	8410185	Y-Stueck mit Flow-Sensor	1.000	St	00000000		
	8409625	WASSERSCHLAUCH AQUAMOD	1.000	St	00000000		
	8409840	Pumpenaggregat Aquamod	1.000	St	00000000		
	8408647	Temp.-Sensor Aquamod	1.000	St	00000000		

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

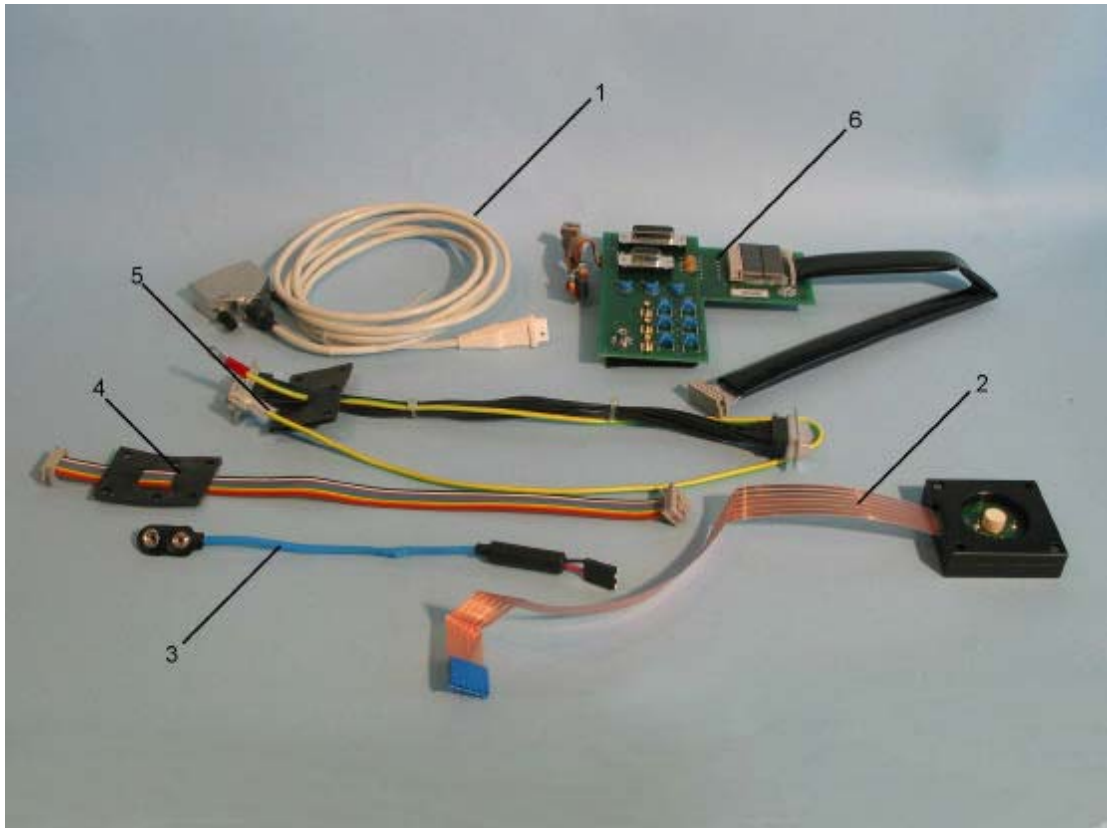
Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8410813	SCHLAUCHSET AQUAMOD	1.000	St	00000000	
	8411148	SCHLAUCHSET AQUAMOD HFV	1.000	St	00000000	
	8408950	EXSP.-Ventil Babylog 8000	1.000	St	00000000	
	8410185	Y-Stueck mit Flow-Sensor	1.000	St	00000000	
	8410179	Flowsensor 5er Set BL8000	1.000	St	00000000	
	8411130	ISO15 Flow-Sensor-Geh.	1.000	St	00000000	
	6850645	CAPSULE FOR O2-DETECTOR (DW)	1.000	St	00000000	
	8409875	TEMPERATURSENSORKABEL 1,2M	1.000	St	00000000	
	8305367	FILTER MAT	1.000	St	29991231	
	8410600	Anfeuchtermodul	1.000	St	00000000	
	8409626	Anschlusskabel Flowsensor	1.000	St	00000000	
	8409680	Silikonschlauch K 0,12m	1.000	St	00000000	
	8409636	Silikonschlauch K 0,25m	1.000	St	00000000	
	8403070	Silikonschlauch K 0,35m	1.000	St	29991231	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

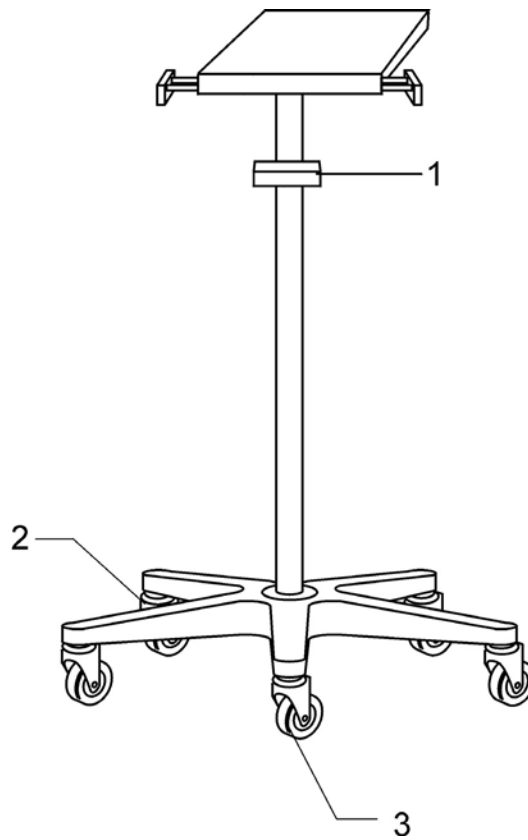
Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	8403073	Siliconschlauch K 0,6m	1.000	St	29991231		
	8403080	Siliconschlauch K 1,0m	1.000	St	29991231		
	8410819	Schlauch (leicht) 0,12m	1.000	St	00000000		
	8410817	SCHLAUCH,(LEICHT)0,25M	1.000	St	00000000		
	8410816	SCHLAUCH,(LEICHT) 0,40M	1.000	St	00000000		
	8410814	SCHLAUCH,(LEICHT) 0,65M	1.000	St	00000000		
	8410815	SCHLAUCH,(LEICHT)1,00 M	1.000	St	00000000		
	8410818	SCHLAUCH,(LEICHT)1,20M	1.000	St	19981231		
	8409897	DOPPELKONUS 11A	1.000	St	00000000		



Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
27	8305367	FILTER MAT	1.000	St	29991231	



Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
1	8409626	Anschlusskabel Flowsensor	1.000	St	00000000		



Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
1-3	8409280	Fahrgestell Babylog 8000	1.000	St	00000000		complete



Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
1-4	8418097	Fahrgestell int. BI 8000	1.000	St	00000000	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	9028004	GA BL 8000 Schnittstelle de/en	1.000	St	00000000		
	9028117	GA KOMMUNIKATION E	1.000	St	00000000		
	9028085	GA-BABYLOG 8000 D/E	1.000	St	00000000		
	9028175	GA-BABYLOG 8000 D	1.000	St	00000000		
	9028220	GA-BABYLOG 8000 E	1.000	St	00000000		
	9028884	GA Babylog 8000 plus 5.n EN	1.000	St	00000000		
	9028885	GA Babylog 8000 SW 5.N FR	1.000	St	00000000		
	9028886	GA Babylog 8000 plus 5.N ES	1.000	St	00000000		
	9028887	GA Babylog 8000 plus 5.N IT	1.000	St	00000000		
	9028888	GA Babylog 8000 plus 5.N SV	1.000	St	00000000		
	9028889	GA Babylog 8000 SW 5.n enUS	1.000	St	00000000		
	9029032	GA Babylog 8000 plus 5.n NL	1.000	St	00000000		
	9029053	GA-BABYLOG 8000 SW 5.N D	1.000	St	00000000		
	9029054	GA-BABYLOG 8000 SW 5.N E	1.000	St	00000000		

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	9029058	GA Babylog 8000 SW 5.n enCA	1.000	St	00000000	
	9029427	GA BABYLOG 8000 plus 5.n RU	1.000	St	00000000	
	9029599	GA BABYVIEW SW 1.n NL	1.000	St	00000000	
	9037162	Beiblatt f.GAs Babylog 8000 de	1.000	St	00000000	
	9037447	GA Babylog 8000 plus 5.n hu	1.000	St	00000000	

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8411014	Grundversion Babylog 8000 SC J	1.000	St	00000000	
	8411219	Grundversion Babylog 8000 SC F	1.000	St	00000000	
	8411220	Grundversion BL 8000 SC d/e	1.000	St	00000000	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	8410813	SCHLAUCHSET AQUAMOD	1.000	St	00000000		
	8403075	Y-PIECE 90DEGREE	1.000	St	29991231		
	M19334	KONNEKTOR F.TRACHEALTUB.2,5	1.000	St	00000000		
	8402953	SET CAPS	1.000	St	29991231		
	8409280	Fahrgestell Babylog 8000	1.000	St	00000000		complete
	8410718	WANDKONSOLE BABYLOG 8000	1.000	St	00000000		
	2M19460	AUFNAHMEPLATTE	1.000	St	00000000		
	8409609	HINGED ARM 240-DEGR.	1.000	St	00000000		
	8411075	SCHLAUCHHALTER	1.000	St	00000000		
	8410250	AQUAMOD 220-240 V	1.000	St	00000000		
	8410565	AQUAMOD 100V	1.000	St	20051231		
	8410600	Anfeuchtermodul	1.000	St	00000000		
	8410535	MODULHALTER F.INKUBATOR 8000	1.000	St	00000000		
	8410536	Modulhalter	1.000	St	00000000		

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	M29239	AIR-CONNECTING HOSE 3M	1.000	St	00000000	
	M29259	AIR-CONNECTING HOSE 5M	1.000	St	00000000	
	M29231	O2-CONNECTION HOSE 3M	1.000	St	00000000	3m blue
	M29251	O2-CONNECTING HOSE 5M	1.000	St	00000000	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	2120941	Baby-Resutator 2000	1.000	St	00000000		
	8407475	PEEP-Valve (Ambu-PEEP)	1.000	St	00000000		
	2105438	SAUERSTOFFSCHLAUCH(119052 0) RE	1.000	St	20001231		
	8409738	KONDENSATABSCHEIDER (IN/EX)	1.000	St	00000000		
	8412628	AIR WATER TRAP MEDIUM DIN/DIN	1.000	St	00000000		
	8412448	ADAPTER 2K	1.000	St	00000000		
	8411025	RUESTSATZ	1.000	St	00000000		
	8411023	KUPPLUNG	1.000	St	00000000		
	8405752	CONE 22A	1.000	St	29991231		
	M19351	KONNEKTOR F.TRACHEALTUB.11	1.000	St	00000000		
	8405000	MEDICAMENT NEBULIZER (PNEU)	1.000	St	20051231		

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8410813	SCHLAUCHSET AQUAMOD	1.000	St	00000000	
	8408950	EXSP.-Ventil Babylog 8000	1.000	St	00000000	
	8409625	WASSERSCHLAUCH AQUAMOD	1.000	St	00000000	
	8409840	Pumpenaggregat Aquamod	1.000	St	00000000	
	8408647	Temp.-Sensor Aquamod	1.000	St	00000000	



Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	8410813	SCHLAUCHSET AQUAMOD	1.000	St	00000000		
	8408950	EXSP.-Ventil Babylog 8000	1.000	St	00000000		
	6850645	CAPSULE FOR O2-DETECTOR (DW)	1.000	St	00000000		
	8409875	TEMPERATURSENSORKABEL 1,2 M	1.000	St	00000000		
	8305367	FILTER MAT	1.000	St	29991231		
	8410600	Anfeuchtermodul	1.000	St	00000000		
	8409680	Silikonschlauch K 0,12m	1.000	St	00000000		
	8409636	Silikonschlauch K 0,25m	1.000	St	00000000		
	8403070	Silikonschlauch K 0,35m	1.000	St	29991231		
	8403073	Silikonschlauch K 0,6m	1.000	St	29991231		
	8403080	Silikonschlauch K 1,0m	1.000	St	29991231		
	8410819	Schlauch (leicht) 0,12m	1.000	St	00000000		
	8410817	SCHLAUCH,(LEICHT)0,25M	1.000	St	00000000		
	8410816	SCHLAUCH,(LEICHT) 0,40M	1.000	St	00000000		

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8410814	SCHLAUCH,(LEICHT) 0,65M	1.000	St	00000000	
	8410815	SCHLAUCH,(LEICHT)1,00 M	1.000	St	00000000	
	8410818	SCHLAUCH,(LEICHT)1,20M	1.000	St	19981231	
	8409897	DOPPELKONUS 11A	1.000	St	00000000	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	9028004	GA BL 8000 Schnittstelle de/en	1.000	St	00000000	
	9028563	GA Babylog 8000 SC de (CE)	1.000	St	00000000	
	9028706	GA Babylog 8000 SC SW 1.n fr	1.000	St	00000000	
	9028741	GA Babylog 8000 SC en	1.000	St	00000000	
	9028881	GA Babylog 8000 SC SW 1.n es	1.000	St	00000000	
	9028882	GA Babylog 8000 SC SW 1.n it	1.000	St	00000000	
	9029520	GA Babylog 8000 SC SW 1.n nl	1.000	St	00000000	
	9029599	GA BABYVIEW SW 1.n NL	1.000	St	00000000	
	9037162	Beiblatt f.GAs Babylog 8000 de	1.000	St	00000000	
	9037230	GA Babylog 8000 SC RU	1.000	St	00000000	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	8411041	Schlauchset F&P	1.000	St	00000000		
	8411153	Schlauchset F&P HFV	1.000	St	00000000		
	8409280	Fahrgestell Babylog 8000	1.000	St	00000000		complete
	2M85337	COMPACT RAIL	1.000	St	00000000		
	8410718	WANDKONSOLE BABYLOG 8000	1.000	St	00000000		
	2M19460	AUFNAHMEPLATTE	1.000	St	00000000		
	8409609	HINGED ARM 240-DEGR.	1.000	St	00000000		
	8411075	SCHLAUCHHALTER	1.000	St	00000000		
	8418285	F&P MR 730 AGU Befeuchter (d)	1.000	St	20121231		
	8418281	F&P MR 700 AGM Humidifier /AEU	1.000	St	20121231		
	8411047	HUMIDIFIER CHAMBER MR 340	1.000	St	00000000		
	8418282	F&P MR290 disp.chamber (10p.)	1.000	St	00000000		
	M29231	O2-CONNECTION HOSE 3M	1.000	St	00000000		3m blue
	M29251	O2-CONNECTING HOSE 5M	1.000	St	00000000		

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	M29239	AIR-CONNECTING HOSE 3M	1.000	St	00000000	
	M29259	AIR-CONNECTING HOSE 5M	1.000	St	00000000	
	M34402	O2-HOSE NIST 3M DIN PROBE	1.000	St	00000000	
	M34403	O2-HOSE NIST 5M DIN PROBE	1.000	St	00000000	
	M34408	AIR-HOSE NIST 3M DIN PROBE	1.000	St	00000000	
	M34409	AIR-HOSE NIST 5M DIN PROBE	1.000	St	00000000	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	8407475	PEEP-Valve (Ambu-PEEP)	1.000	St	00000000		
	2105438	SAUERSTOFFSCHLAUCH(1190520) RE	1.000	St	20001231		
	8409738	KONDENSATABSCHEIDER (IN/EX)	1.000	St	00000000		
	8412628	AIR WATER TRAP MEDIUM DIN/DIN	1.000	St	00000000		
	8412448	ADAPTER 2K	1.000	St	00000000		
	8411025	RUESTSATZ	1.000	St	00000000		
	8411023	KUPPLUNG	1.000	St	00000000		
	8411024	Dichtstopfen	1.000	St	00000000		
	8411030	Medikamentenvernebler	1.000	St	00000000		
	2120941	Baby-Resutator 2000	1.000	St	00000000		

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8411041	Schlauchset F&P	1.000	St	00000000	
	8411153	Schlauchset F&P HFV	1.000	St	00000000	
	8408950	EXSP.-Ventil Babylog 8000	1.000	St	00000000	
	8410185	Y-Stueck mit Flow-Sensor	1.000	St	00000000	
	8411130	ISO15 Flow-Sensor-Geh.	1.000	St	00000000	
	8403075	Y-PIECE 90DEGREE	1.000	St	29991231	
	8401645	CAP (7 MM)	1.000	St	29991231	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	8411041	Schlauchset F&P	1.000	St	00000000		
	8411153	Schlauchset F&P HFV	1.000	St	00000000		
	8408950	EXSP.-Ventil Babylog 8000	1.000	St	00000000		
	8410185	Y-Stueck mit Flow-Sensor	1.000	St	00000000		
	8410179	Flowsensor 5er Set BL8000	1.000	St	00000000		
	8411130	ISO15 Flow-Sensor-Geh.	1.000	St	00000000		
	8403075	Y-PIECE 90DEGREE	1.000	St	29991231		
	8401645	CAP (7 MM)	1.000	St	29991231		
	8411048	DUAL AIRWAY TEMP. SENSOR 1,45M	1.000	St	00000000		
	8411050	DRAW WIRE 1,50 M 900 MR 070	1.000	St	00000000		
	8411045	HOSE HEATER 1,1M 900 MR511	1.000	St	00000000		
	8411154	HEATER WIRE 0,70M HFV-F&P	1.000	St	00000000		
	8305367	FILTER MAT	1.000	St	29991231		
	8409626	Anschlusskabel Flowsensor	1.000	St	00000000		



Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	8409680	Silikonschlauch K 0,12m	1.000	St	00000000	
	8409636	Silikonschlauch K 0,25m	1.000	St	00000000	
	8403070	Silikonschlauch K 0,35m	1.000	St	29991231	
	8403073	Silikonschlauch K 0,6m	1.000	St	29991231	
	8403080	Silikonschlauch K 1,0m	1.000	St	29991231	
	8410819	Schlauch (leicht) 0,12m	1.000	St	00000000	
	8410817	SCHLAUCH,(LEICHT)0,25M	1.000	St	00000000	
	8410816	SCHLAUCH,(LEICHT) 0,40M	1.000	St	00000000	
	8410814	SCHLAUCH,(LEICHT) 0,65M	1.000	St	00000000	
	8410815	SCHLAUCH,(LEICHT)1,00 M	1.000	St	00000000	
	8410818	SCHLAUCH,(LEICHT)1,20M	1.000	St	19981231	
	8409897	DOPPELKONUS 11A	1.000	St	00000000	
	8411044	PROBE-THERMOMETER HOUSING DRAE	1.000	St	00000000	
	8418405	Temp. Sensoraufnahme D15/D10	1.000	St	00000000	

Keine Zeichnung vorgesehen  
 No drawing planned/scheduled  
 Aucun schéma prévu  
 Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page Remark
	9028004	GA BL 8000 Schnittstelle de/en	1.000	St	00000000	
	9028884	GA Babylog 8000 plus 5.n EN	1.000	St	00000000	
	9028885	GA Babylog 8000 SW 5.N FR	1.000	St	00000000	
	9028886	GA Babylog 8000 plus 5.N ES	1.000	St	00000000	
	9028887	GA Babylog 8000 plus 5.N IT	1.000	St	00000000	
	9028888	GA Babylog 8000 plus 5.N SV	1.000	St	00000000	
	9028889	GA Babylog 8000 SW 5.n enUS	1.000	St	00000000	
	9029032	GA Babylog 8000 plus 5.n NL	1.000	St	00000000	
	9029053	GA-BABYLOG 8000 SW 5.N D	1.000	St	00000000	
	9029054	GA-BABYLOG 8000 SW 5.N E	1.000	St	00000000	
	9029058	GA Babylog 8000 SW 5.n enCA	1.000	St	00000000	
	9029427	GA BABYLOG 8000 plus 5.n RU	1.000	St	00000000	
	9029599	GA BABYVIEW SW 1.n NL	1.000	St	00000000	
	9037162	Beiblatt f.GAs Babylog 8000 de	1.000	St	00000000	

Keine Zeichnung vorgesehen  
No drawing planned/scheduled  
Aucun schéma prévu  
Ningún plano previsto

Item No.	Part No.	Description	Qty.	Qty.unit	Rep.end	Page	Remark
	9037447	GA Babylog 8000 plus 5.n hu	1.000	St	00000000		



# General

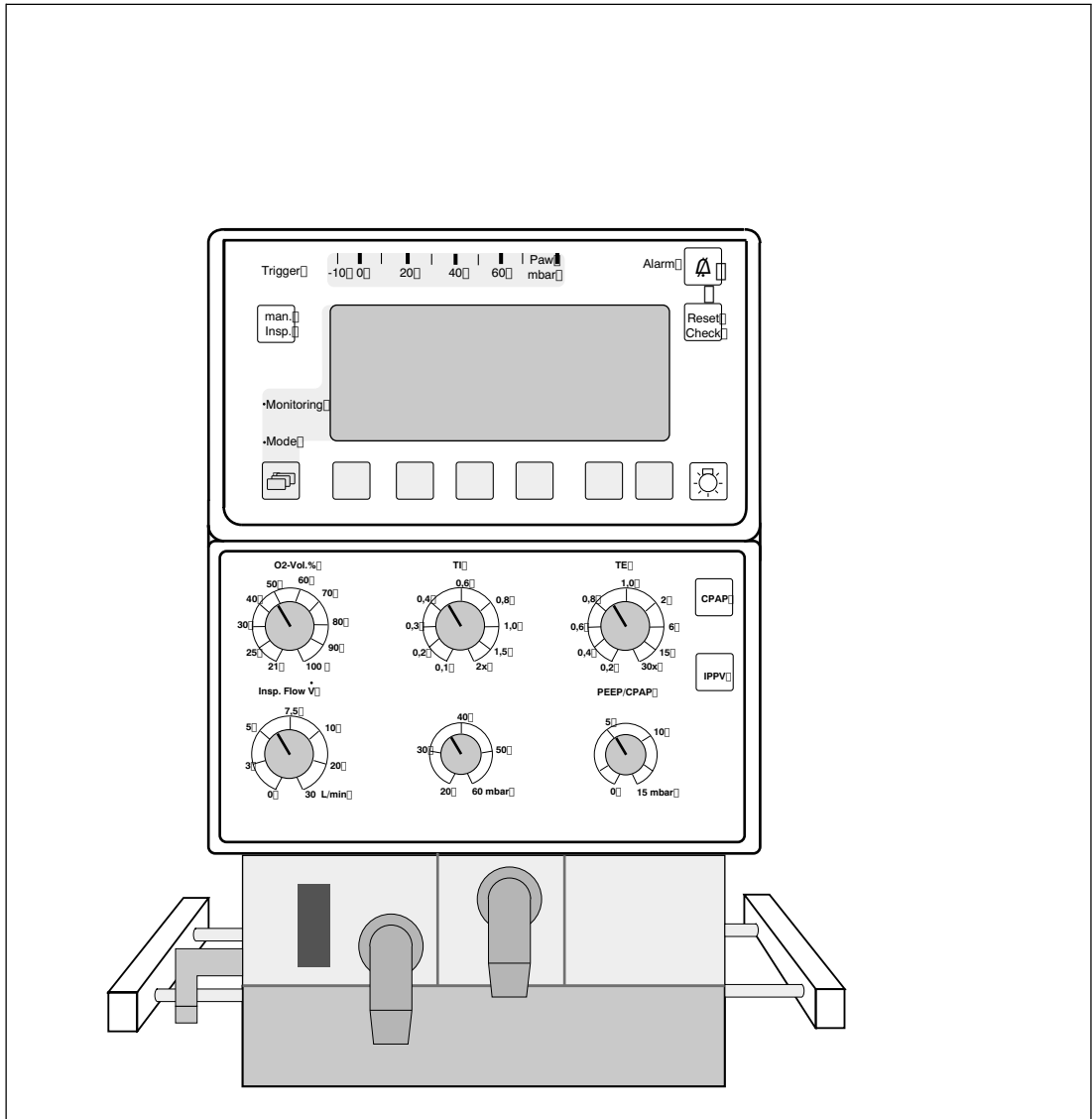
## Babylog 8000/Babylog 8000 plus/Babylog 8000 SC

Serial no.: \_\_\_\_\_

Installation site: \_\_\_\_\_

Folder no.:  
6173.3

Edition:  
12/94



## 1 Test Equipment

	Measuring Range	Accuracy Class (according to VDE/VDI 3513)
Manometer	0 to 5 bar	1.0
Manometer	-30 to +120 mbar	1.0
Test pressure reducer		
Flowmeter	10 to 120 L/min	1.6
Secretion sightglass		
Tracheal tube		
Bellows (children)		
T-piece		

## 2 Accompanying Documents

### **Instructions for Use (according to software version) for Babylog 8000/ Babylog 8000 plus (with flow measurement)**

Instructions for Use of analog and digital interfaces

Check List

### **Instructions for Use (according to software version) of Babylog 8000 SC (without flow measurement)**

Check List



### 3 General Condition of Babylog 8000/8000 plus/ 8000 SC

#### Rear Panel

O<sub>2</sub>/AIR inlet block

Connection socket for flow sensor cable

Fan cover

Filter mat for fan

ON/OFF switch with locking device

Power cable

RS232 connection port (if available)

2 analog outputs and 1 pulse output (if available)

Central-alarm output (if available)

Drug nebulizer output (if available)



#### Side Panels



#### Front Electronics/Pneumatics Assembly

Potentiometer field flap

Potentiometer field

Display field

Front pneumatic assembly

Inspiratory block

Inspiratory connection port

O<sub>2</sub> sensor mount

Filter for emergency respiratory equipment

Base plate for adaptation of the expiratory valve



## **Expiratory Valve**

Crater

Expiratory diaphragm

O-ring on cover/expiratory valve

Expiratory connection port

Locking mechanism with ball cage

Ejector

Silencer



## **4 General Condition of the Accessories Required for Operation**

Y-piece with flow sensor 8410185 with flow sensor set 8410179 (only in the Babylog 8000/Babylog 8000 plus)

Flow sensor (ISO) 84 11 015 with flow sensor set 8410179 (only in the Babylog 8000/Babylog 8000 plus)

Flow sensor (ISO 15, low dead space) 84 11 130 with flow sensor set 84 10 179 (only in the Babylog 8000/Babylog 8000 plus)

Flow sensor cable (only in the Babylog 8000/Babylog 8000 plus)

Printer cable, 9-pin Sub-D connector on 25-pin Sub-D connector (optional)

Monitor cable (Medibus cable), 9-pin Sub-D connector on 9-pin Sub-D connector (optional)

Analog cable (optional)





## 5 General Condition of the Accessories

Trolley 0.5 B

Short rail for humidifier

Platform with rails type 1 0.5 B

Monitor support (Incubator 8000)

Humidifier

Hinged arm

Hinged arm (Incubator 7500)

Central gas supply connecting hoses for O<sub>2</sub> and AIR

Water trap Ex

Bacterial filter with connecting set

Drug nebulizer



## 6 General Condition of the Special Accessories

Resutator bag (baby)

PEEP valve for Resutator bag (baby)

1.8 m hose for Resutator bag (baby)

Insp./exp. water trap set



## 7 Functional Check

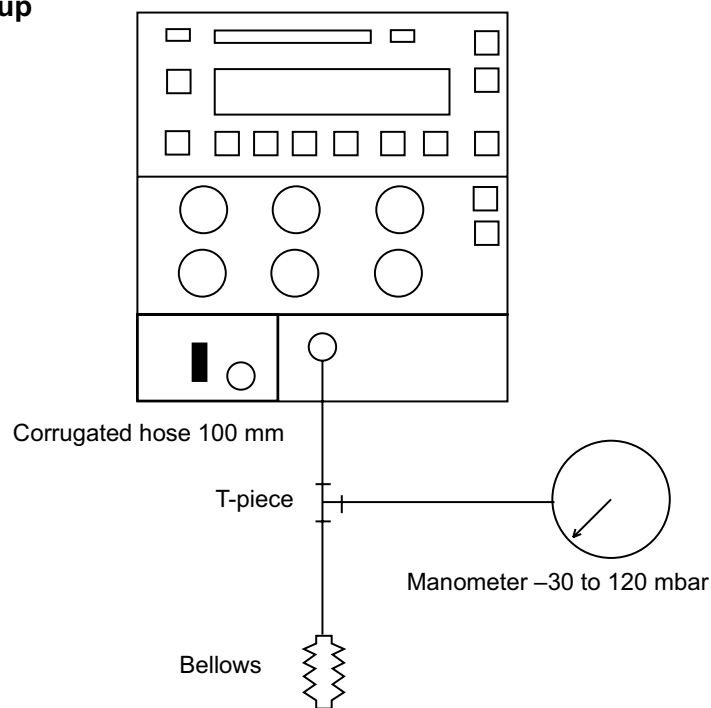
Connect the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC to the central gas supply and switch on the device.  
The software version will be displayed as soon as the self-test has been completed.



## 8 Testing the Emergency AIR Valve

Switch off the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC and prepare the following test set-up (see Figure below).

### Test set-up



**Fig. 1:** Emergency AIR Valve

- Slowly pull the test bellows.

The bellows must fill up.

- a.) Babylog 8000 SW 2.0 and SW 3.00  
The opening pressure is  $-1.5$  mbar to 0 mbar

- b.) Babylog 8000 SW 2.02, SW 3.02, SW 4.n without HFV  
The opening pressure is  $-4$  mbar to  $0$  mbar
- c.) Babylog 8000 SW 4.n with HFV  
The opening pressure is  $-4$  to  $-2$  mbar



## 9 Testing the Safety Valve

The Babylog 8000/Babylog 8000 plus/Babylog 8000 SC is switched off. Remove the expiratory valve.

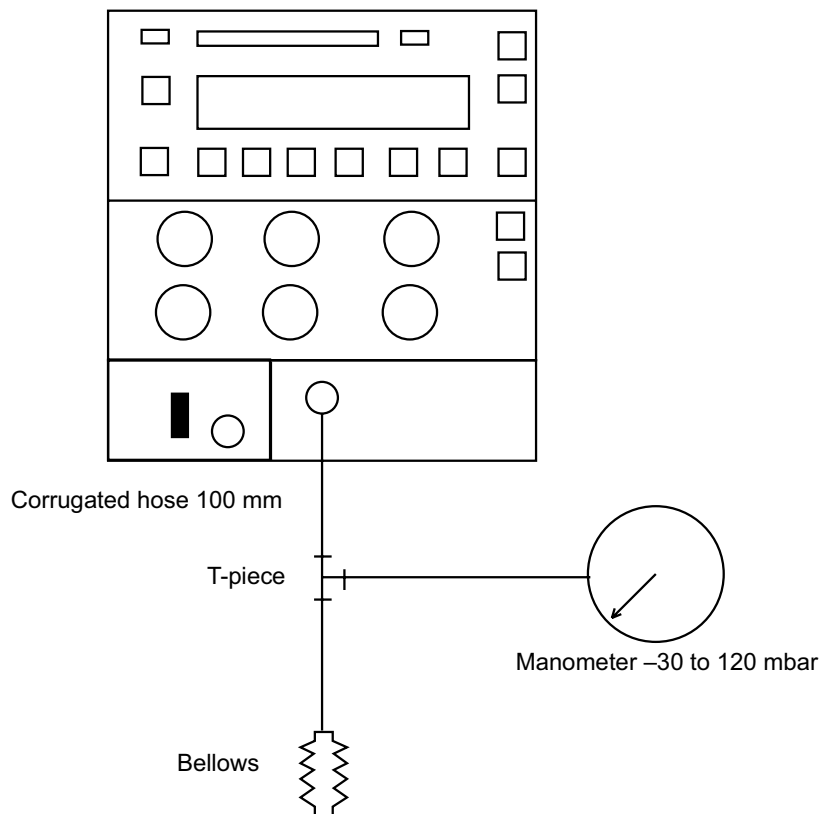
**(Important:** There are two variants of the safety valve.)

**Variant A:** opening pressure 25 mbar

**Variant B:** opening pressure 100 mbar

(You can recognize the relevant variant by the test value measured.)

### Test set-up



**Fig. 2:** Safety Valve

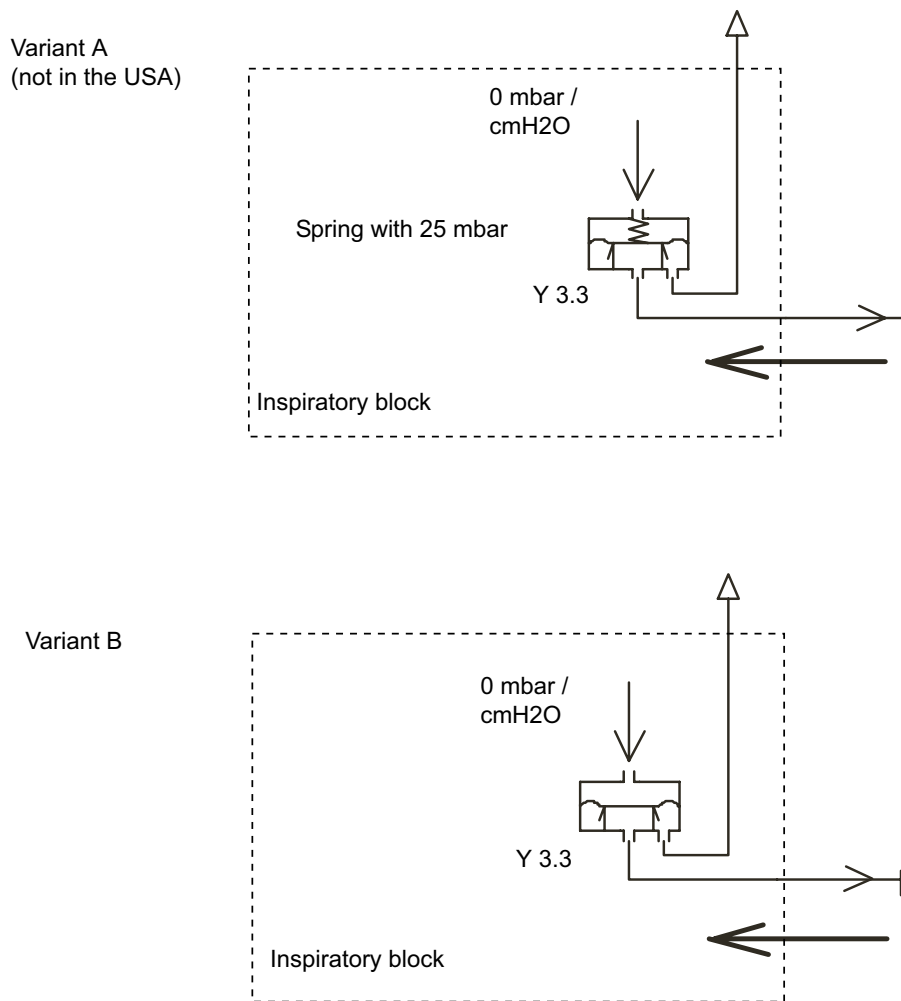
Slowly compress the bellows and generate the following pressure.

**Variant A:** opening pressure =  $25 \pm 5$  mbar

**Variant B:** opening pressure =  $5 \pm 5$  mbar



## 9.1 Test 1 Without Control Pressure



**Fig. 3:** Test 1

- Slowly compress the bellows.

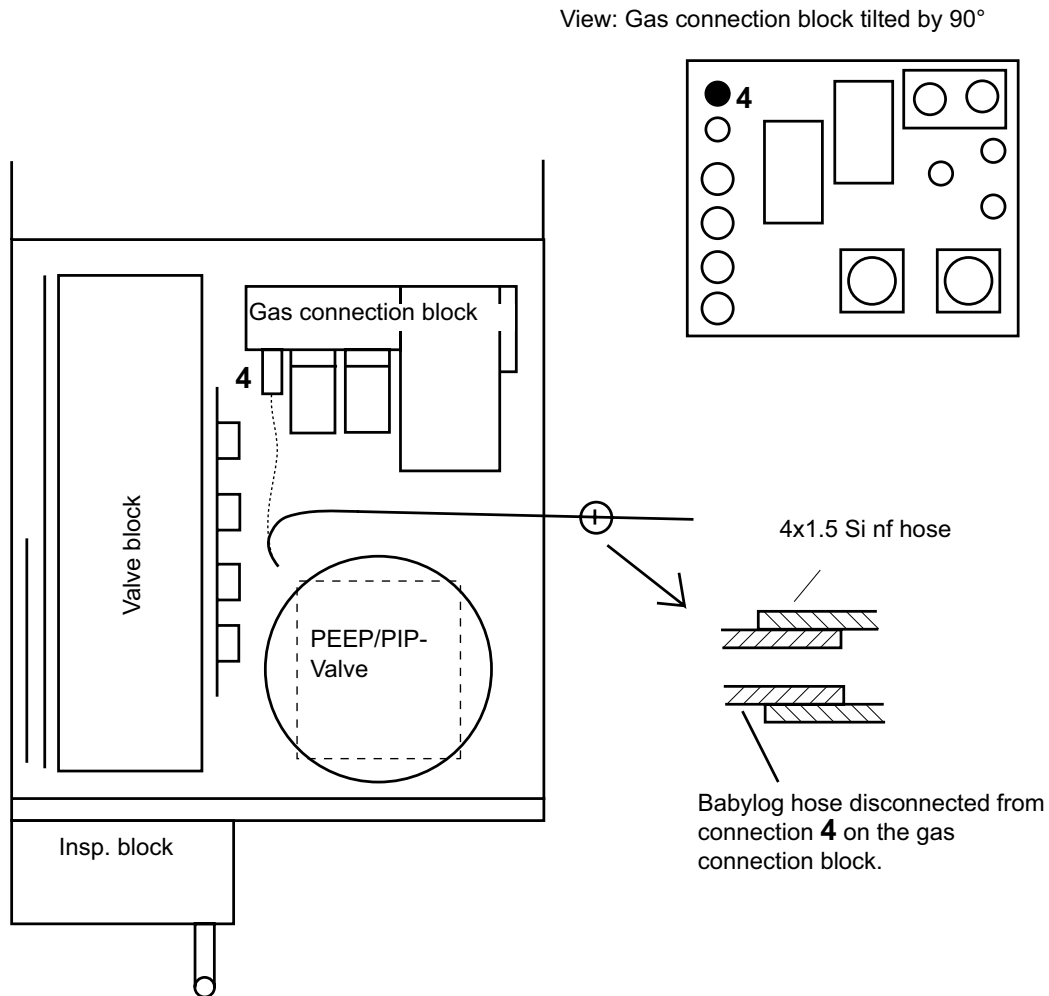
In variant **A** the pressure is  $25 \pm 5$  mbar,  
in variant **B** it is  $5 \pm 5$  mbar.



## 9.2 Test 2 With Control Pressure

Use the same test set-up as in Test 1 and proceed as follows:

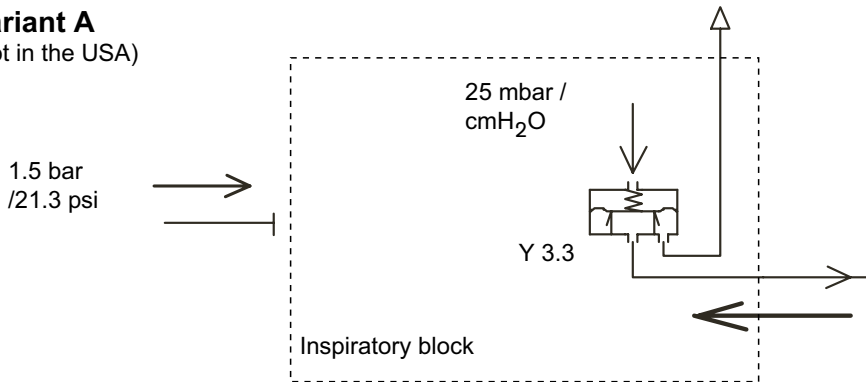
Remove the bottom plate from the Babylog 8000/Babylog 8000 plus/  
Babylog 8000 SC and disconnect the hose from connection **4** on the gas connection  
block. Apply a pressure of 1.5 bar  $\pm$ 0.1 bar into this hose (see Figure below).



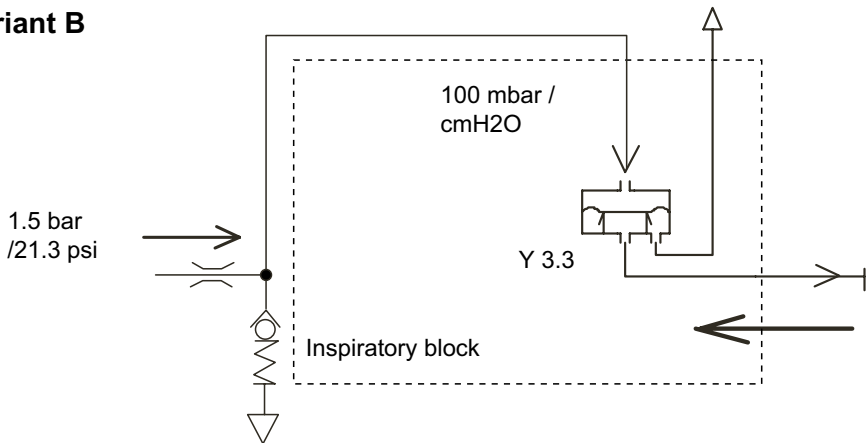
**Fig. 4:** Test 2

**Babylog 8000/Babylog 8000 plus/Babylog 8000 SC Test Performance:**

**Variant A**  
(not in the USA)



**Variant B**



**Fig. 5: Test Performance**

**Important:** If during Test 1 the variant **A** and during Test 2 the variant **B** (pressure values possibly too high) is recognized, then it is a **B** variant with a non-permissible spring mounted in the valve Y 3.3. This spring must be removed and the test be repeated. Mount the bottom cover.

- Slowly compress the bellows and generate the following pressure:

**Variant A** : 25 mbar  $\pm$ 5 mbar.

**Variant B** : 100 mbar  $\pm$ 10 mbar.



## 10 Calibration / LED / Potentiometer Test

- Assemble the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC including the tubing system but without the humidifier.
- Switch the device on.
- Note the software version and the operating hours down.

**Communication conversion kit y/n** (is displayed under the operating hour indication after power-on).

**Important:** 8306065 or 8411108 (see nameplate option field) without central-alarm function. The sockets for the communication interface may be present even if this function is not available.

- O<sub>2</sub> calibration.
- Flow sensor calibration (only in the Babylog 8000).

LED and horn test (press and hold the “Reset Check” : after 2 s, each LED and the stand-by horn are triggered.).

**Important:**

Alarm LEDs = 1 yellow and 2 red LEDs

Trigger LEDs = 3 yellow LEDs

Display backlight.

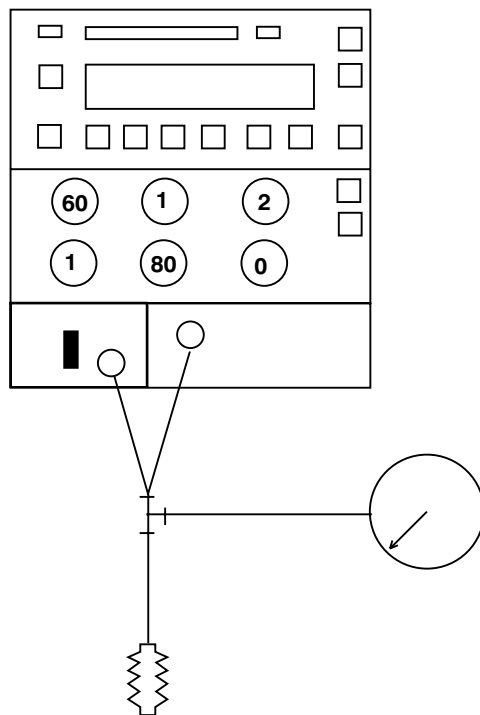
- Testing the keys (check respective reaction of the equipment).

Potentiometers (no fault message about potentiometer malfunction).



## 11 Leak Test

- Adjust the following parameters on the Babylog 8000/  
Babylog 8000 plus/Babylog 8000 SC (see Figure below):



**Fig. 6:** Leak Test

- Select **pressure** from the menu “pressure curve” and “measured values”.
- Switch off occurring alarms and warnings by pressing the “Reset/Check” key.
- Press and hold the **manual inspiration** key.

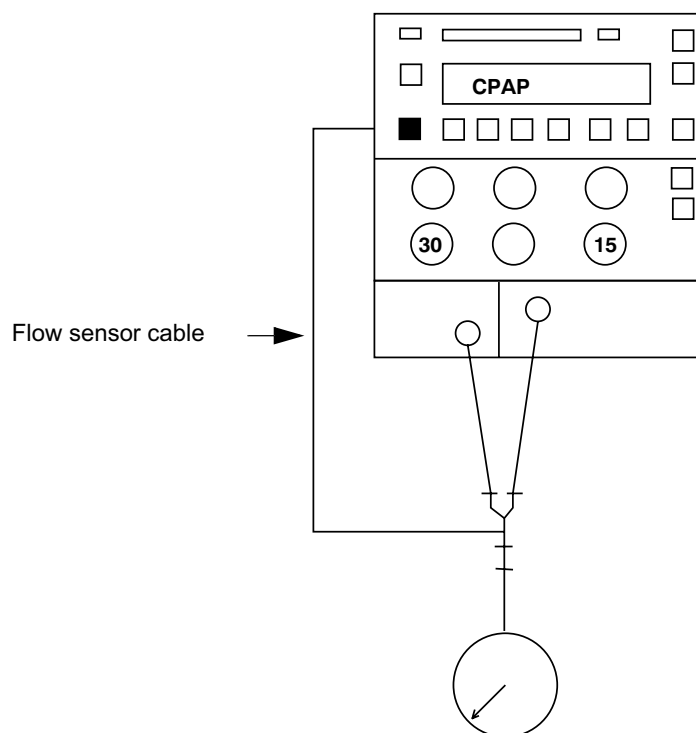
A pressure is now built up for 5 s. During this time, a pressure of at least 75 mbar must be achieved.





## 12 Testing the Pressure Regulator

- Connect the inspiratory socket with the expiratory socket.
- Adjust the device as shown in the Figure below



**Fig. 7:** Pressure Regulator

- Connect the device to the O<sub>2</sub> supply only.

The following message is displayed on the device: **“no medical air”**.

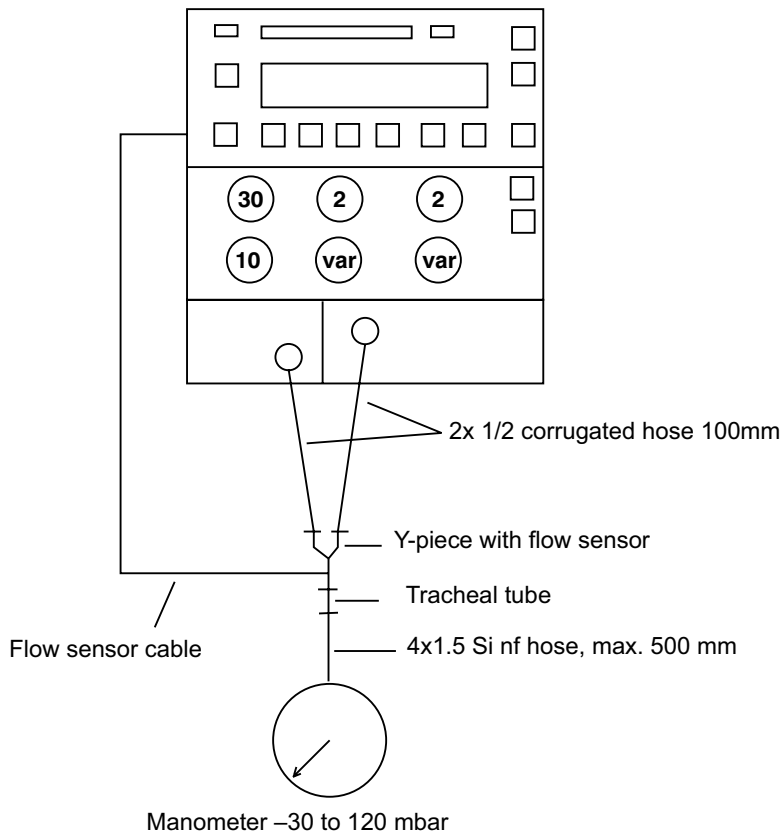
- Connect the device to the medical AIR supply only.

The following message is displayed on the device: **“no oxygen”**.



## 13 Airway Pressure Measurement

- Test set-up (see Figure below):



**Fig. 8:** Airway Pressure Measurement

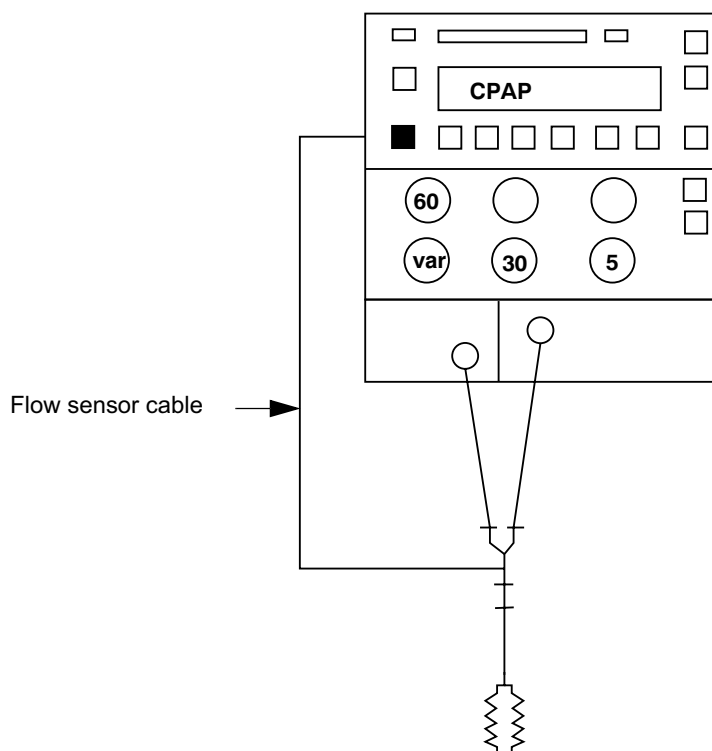
- Select the functions “setting” and “measured value” from the “list” menu:

Setting	Measured value	Manometer
PEEP = 0 mbar	0 ±1 mbar	0 ±2 mbar
Pinsp = 30 ±2 mbar	30 ±1 mbar	30 ±2 mbar
Pinsp = 60 mbar	60 ±2 mbar	60 ±3 mbar
PEEP = 5 mbar	5 ±1 mbar	5 ±2 mbar
PEEP = 10 mbar	10 ±1 mbar	10 ±2 mbar
PEEP = 15 mbar	15 ±1 mbar	15 ±2 mbar



## 14 Testing the Mixer

- Carry out an O<sub>2</sub> calibration.
- Test set-up (see Figure below):



**Fig. 9:** Mixer

- Select the following inspiratory flows from the “list” menu: 1.2 / 1.3 / 1.4 / 1.5 / 1.6 / 1.7 / 1.8 / 1.9 / 2.0 / 4 / 5 / 6 / 8 / 9 / 9.9 / 11 / 12 / 13 / 14 / 15 / 30

Allow approx. 1 min between setting and measurement of flow values (< 2 L/min). If no values is set, the alarm “FiO<sub>2</sub> deviation” is allowed to occur.



## 15 Testing the Patient System Heating

- Put your hand against the expiratory valve block.

The temperature should exceed the room temperature.



## 16 Testing the Fan

- Put your hand on the upper right corner of the rear panel of the Babylog 8000/Babylog 8000 plus/Babylog 8000 SC.

You should feel an AIR flow through the filter mat.

## 17 Testing the Power Failure Alarm

- Unplug the power plug from the wall outlet.

The acoustic alarm should start.

## 18 Testing the Gas Failure Alarm

### O<sub>2</sub> Failure Alarm

- Set the O<sub>2</sub> adjuster to 100 vol.% and disconnect the O<sub>2</sub> supply.
- Switch on the Babylog 8000/Babylog 8000 SC:

Message on the device: **“no oxygen”**

### Medical AIR Failure Alarm

- Re-connect the O<sub>2</sub> supply.
- Set the O<sub>2</sub> adjuster to 21 vol.% and disconnect the medical AIR supply:

Message on the device: **“no medical air”**

- Re-connect the medical AIR supply.

**19 Tests According to VDE 0751 Part 1**  
(Follow the national and international laws, standards and regulations applicable in your country)

Power cable

Mains fuse-unit  
(the specifications on the fuse-unit must match those on the rating plate)

Protective earth conductor test  $\leq 0.2$  W

Equivalent device leakage current  $\leq 1.0$  mA

Patient leakage current  $\leq 4.0$  mA

**20 Place fully functional unit at customer's disposal.**

**21 Tested**

Date: \_\_\_\_\_ Name: \_\_\_\_\_



2004-09-24

## Technical Documentation for Babylog 8000 plus according to EMC standard IEC/EN 60601-1-2: 2001

### General Information

The EMC conformity includes the use of following external cables, transducers and accessories (see the following table):

<b>Designation</b>	<b>Order no.</b>
Flow sensor	8410185
Flow sensor connecting cable	8409626
Communication conversion kit	8411108
Analog cable	8306487
MIB connecting cable	5198952

Additionally, accessories may be used which do not affect EMC compliance, if no other reasons interdict the use of them (see chapter Order List in the Instructions for Use manual). Non-compliance may result in increased emissions or decreased immunity of the Babylog 8000 plus.

Babylog 8000 plus should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is inevitable, Babylog 8000 plus should be observed to verify normal use in the configuration in which it will be used.

Other equipment which can be used adjacent to or stacked with the Babylog 8000 plus are listed in the Instructions for Use manual, in the Order List chapter or in the following table.

<b>Designation</b>	<b>Order no.</b>
Fisher & Paykel humidifier - accessories	84 14 144
Optional graphic screen	84 15 834
ECG monitoring	Various, on demand

## Electromagnetic Emissions

<b>Electromagnetic Emissions</b>		
Babylog 8000 plus is intended for use in the electromagnetic environment specified below. The operator should assure that is used in such an environment.		
<b>Emissions</b>	<b>Compliance according to</b>	<b>Electromagnetic environment</b>
RF emissions (CISPR 11)	Group 1	Babylog 8000 plus uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
	Class A	Babylog 8000 plus is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions (IEC 61000-3-2)	Not applicable	Not applicable because RF emissions are class A.
Voltage fluctuations / flicker (IEC 61000-3-3)	Not applicable	Not applicable because RF emissions are class A.

Information re electromagnetic emissions (IEC 60101-1-2: 2001, table 201)



## Electromagnetic Immunity

Electromagnetic Immunity			
Babylog 8000 plus is intended for use in the electromagnetic environment specified below. The operator should assure that is used in such an environment.			
Immunity against	IEC 60601-1-2 test level	Compliance level (Babylog 8000 plus)	Electromagnetic environment
electrostatic discharge, ESD (IEC 61000-4-2)	contact discharge: ± 6 kV air discharge: ± 8 kV	± 2, 4, 6 kV ± 2, 4, 8 kV	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
electrical fast transients / bursts (IEC 61000-4-4)	power supply lines: ± 2 kV longer input / output lines: ± 1 kV	± 2 kV ± 1 kV	Mains power quality should be that of a typical commercial or hospital environment.
surges on AC mains lines (IEC 61000-4-5)	common mode: ± 2 kV differential mode: ± 1 kV	± 2 kV ± 1 kV	Mains power quality should be that of a typical commercial or hospital environment.
power frequency magnetic field 50/60 Hz (IEC 61000-4-8)	3 A/m	3 A/m	In close vicinity to Babylog 8000 plus, no equipment with extraordinary power frequency magnetic fields (power transformers, etc.) should be operated.
voltage dips and short interruptions on AC mains input lines (IEC 61000-4-11)	dip >95%, 0.5 periods dip 60%, 5 periods dip 30%, 25 periods dip >95%, 5 seconds	>95%, 0.5 per. 60%, 5 per. 30%, 25 per. >95%, 5 sec.	Mains power should be that of a typical commercial or hospital environment. If operator requires continued operation during power mains interruptions, it is recommended to power the Babylog 8000 plus from an uninterruptible supply or a battery.
radiated RF (IEC 61000-4-3)	80 MHz – 2.5 GHz: 10 V/m	10 V/m	Recommended separation distance from portable and mobile RF transmitters with transmission power $P_{EIRP}$ to Babylog 8000 plus including its lines: $1.84 \text{ m} * \sqrt{P_{EIRP}}^{X1}$
RF coupled into lines (IEC 61000-4-6)	150 kHz – 80 MHz: 10 V within ISM bands, 3 V outside ISM bands <sup>X2</sup>	10 V  3 V	Recommended separation distance from portable and mobile RF transmitters with transmission power $P_{EIRP}$ to Babylog 8000 plus including its lines: $1.84 \text{ m} * \sqrt{P_{EIRP}}^{X1}$

Information re electromagnetic immunity (IEC 60601-1-2: 2001, tables 202, 203, 204)

<sup>X1</sup>: For  $P_{EIRP}$  the highest possible "equivalent isotropic radiated power" of the adjacent RF transmitter has to be inserted (value in Watt). Also in the vicinity of equipment marked with the symbol



interference may occur. Field strengths from fixed, portable or mobile RF transmitters at the location of Babylog 8000 plus should be less than 3 V/m in the frequency range from 150 kHz to 2.5 GHz and less than 1 V/m above 2.5 GHz.

<sup>X2</sup>: ISM bands in this frequency range are: 6.765 MHz - 6.795 MHz, 13.553 MHz - 13.567 MHz, 26.957 MHz - 27.283 MHz, 40.66 MHz - 40.70 MHz.

## Recommended separation distances

<b>Recommended separation distances between portable and mobile RF telecommunication devices and Babylog 8000 plus</b>			
<b>max. P<sub>EIRP</sub> (W)</b>	<b>3 V/m distance* (m)</b>	<b>1 V/m distance* (m)</b>	<b>Note</b>
0.001	0.06	0.17	
0.003	0.10	0.30	
0.010	0.18	0.55	
0.030	0.32	0.95	e.g. WLAN 5250 / 5775 (Europe)
0.100	0.58	1.73	e.g. WLAN 2440 (Europe), Bluetooth
0.200	0.82	2.46	e.g. WLAN 5250 (not in Europe)
0.250	0.91	2.75	e.g. DECT devices
1.000	1.83	5.48	e.g. GSM 1800- / GSM 1900- / UMTS- mobiles, WLAN 5600 (not in Europe)
2.000	2.60	7.78	e.g. GSM 900 mobiles
3.000	3.16	9.49	

Information re separation distances (IEC 60601-1-2: 2001, tables 205 and 206)

\* 3 V/m distance to transmitters with frequencies from 150 kHz to 2.5 GHz, otherwise 1 V/m distance.

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