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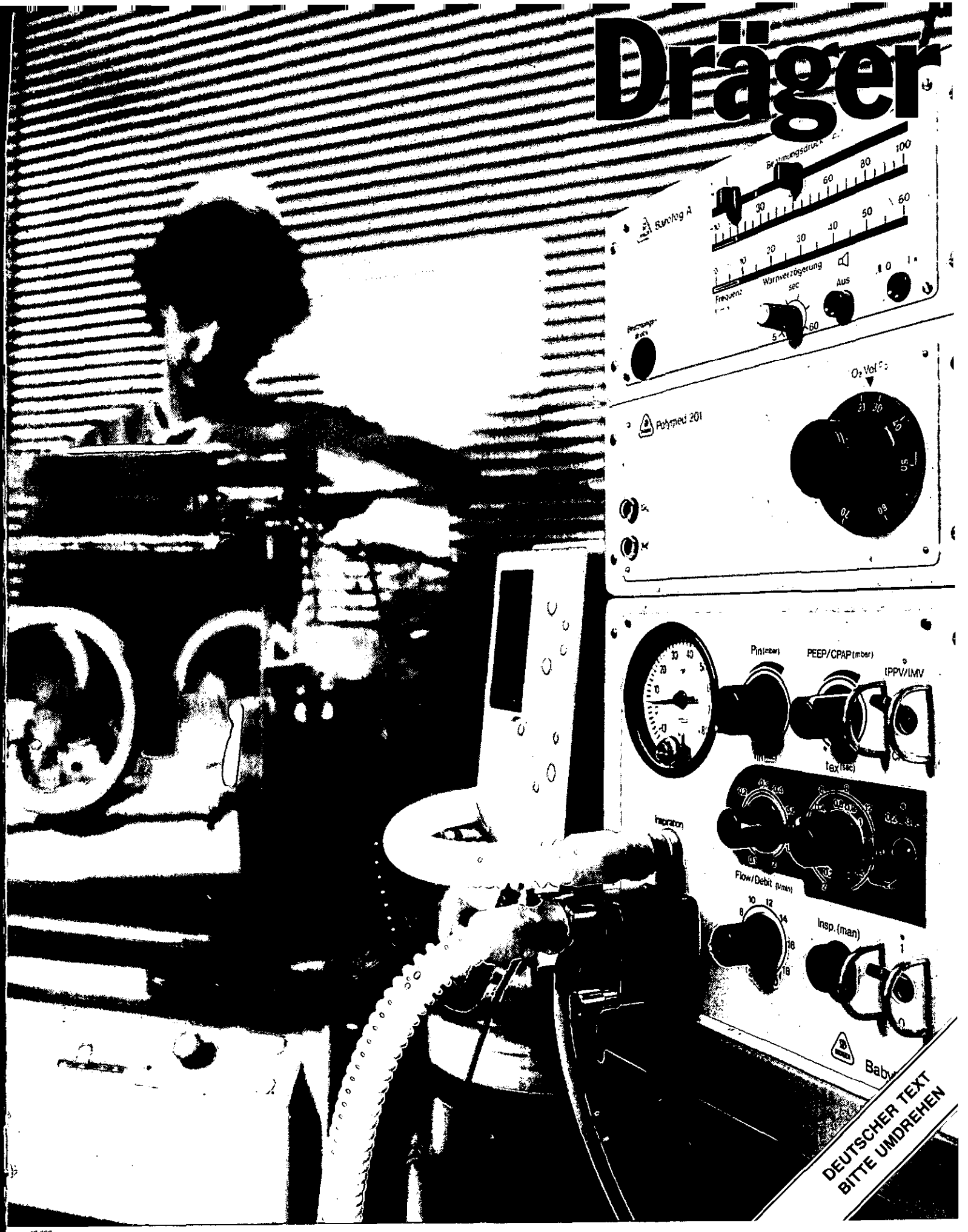

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OPERATING MANUAL

Babylog 1 Ventilator

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From Dräger: Babylog 1 Ventilator

OPERATING INSTRUCTIONS

Important Notice

For correct and effective use of the device, and to avoid hazards, we would point out the following:

1 Any use of the device requires precise knowledge and observation of these operating instructions.
2 The device is intended only for the purposes specified in the Operating Manual or for purposes confirmed in writing by Drägerwerk AG.
3 The device should be inspected by experts at regular time intervals. An official report of the inspections should be drawn up.
4 Only original Dräger spare parts should be used for maintenance and repairs. Repairs and maintenance, and the replacement of spare parts should only be carried out by experts.
5 We recommend having inspections and repair work carried out by the Technical Customer Service of your Dräger Branch or Agent.
Regular inspection is best ensured by entering into an Inspection Service Contract with the Technical Customer Service of your Dräger Branch or Agent.
6 Responsibility for the reliable function of the device passes to the owner or operator in all cases where the device has been inexpertly maintained or repaired by persons not employed by the Dräger Organization or where it has been used in a manner which does not conform to the normal conditions of use.
7 For reasons of safety, pressure reducers should be overhauled at least every 6 years.
8 The oxygen blender is to be overhauled every 4 years for safety reasons.
9 This device is intended only for use in areas without danger of explosion.

We would also point out that the national recommendations, regulations and laws governing the use of technical equipment should be observed.

DRÄGERWERK AG LÜBECK

We would like to point out the recommendations of DGAI (Deutsche Gesellschaft für Anaesthesie und Intensivmedizin, or German Association for Anaesthesia and Intensive Care Medicine) which urge that a manual ventilator should be available which is independent of the automatic ventilator and ensures ventilation of the patient with ambient air. If the vital function is no longer ensured in case of a recognizable fault of the ventilator, ventilation of the patient with the separate manual ventilator must be started without delay, if necessary with PEEP and/or a higher inspiratory O_2 concentration (cf. operating instructions for the manual ventilator).

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Intended Use

Clinical ventilator for premature and newborn babies and infants up to 2 years, corresponding to 15 kg body weight, to carry out IPPV, CPAP or IMV, with integrated PEEP valve.

Key to abbreviations used

MV = Minute volume (L/min)

CPAP = Continuous Positive Airway Pressure

IPPV = Intermittent Positive Pressure Ventilation

IMV = Intermittent Mandatory Ventilation

PEEP = Positive Endexpiratory Pressure

Technical Data

Control principle	continuous flow
Inspiration start	time-controlled or manual start
Expiration start	time-controlled
Inspiratory pressure characteristics	linear pressure increase with possibility of continuous plateau adjustment
Expiratory pressure PEEP/CPAP	endexpiratory pressure from 0 to 10 mbar
Airway pressure adjustment during inspiration P_{in}	continuous from 10 to 60 mbar plateau pressure; pressure indication by pressure gauge, pick-up in expiration section
Inspiratory flow and expiratory flow for IPPV, IMV or CPAP	continuous from 2 to 20 L/min
Inspiratory time t_{in}	continuous from 0.3 to 2 seconds
Expiratory time t_{ex}	continuous from 0.5 to 6 seconds or continuous from 5 to 60 seconds (depending on the position of the range selector switch t_{ex})
Oxygen concentration	via O_2 blender
Drive gas, operating pressure	dry compressed air, free of oil and dust, or O_2 (2 to 6 bar) from a central supply system
Connecting an O_2 blender a) Using Dräger Polymed (Fig. 11): An intake pressure of between 2 and 6 bar must be ensured at the left connection **15**. The O_2 blender must be capable of supplying at least 20 L/min on a *continuous basis* b) Using the blending device with flowmeter unit (Fig. 12): Connect the outlet of the flowmeter unit to the right connection **17** (intake pressure < 100 mbar) **In order to ensure the control function of the device, it is necessary to feed O_2 (2 to 6 bar) to the device through the left-hand screw connection 15 (see rear of unit)**	 O_2 switch **16** to left O_2 switch **16** to right
Compressed-gas consumption	Since the unit operates on the continuous flow principle, gas consumption does not depend on the MV, but matches the set flow directly (flow knob)
IPPV-IMV/CPAP switch	for IPPV-IMV or continuous flow (CPAP)
"Manual inspiration" button	for starting manual inspiration and "inflation hold"
The settings to the green dot correspond to the following values: Inspiratory pressure limit P_{in} Expiratory pressure PEEP/CPAP Inspiratory time t_{in} Expiratory time t_{ex} with range selector switch in position "0.5 to 6 s"	 approx. 20 mbar 0 mbar approx. 0.7 s approx. 1.1 s
Weight	approx. 5 kg

What's What?

(Figs. 1 and 2)

1 Expiratory valve (removable)
2 Expiration nozzle
3 Inspiration nozzle
4 Knob for inspiratory time t_{in}
5 Airway pressure gauge
6 Inspiratory pressure limit P_{in}
7 Expiratory pressure PEEP/CPAP
8 Switch IPPV-IMV/CPAP
9 Knob for expiratory time t_{ex}
10 Range selector switch t_{ex}
11 Switch (On/Off)
12 Key for manual inspiration
13 Carriage
14 Flow knob
15 Connection M 15 × 1 for
   a) mixed gas: compressed air/O_2, 2 to 6 bar (from Polymed blender)
   b) O_2 (or compressed air), 2 to 6 bar as drive gas (if mixed gas is fed from the flowmeter blender via connection **17**)
16 Selector switch for O_2 blender
17 Connection M 16 × 1.5 for mixed gas: compressed air/O_2 (< 100 mbar)
18 Retaining screws

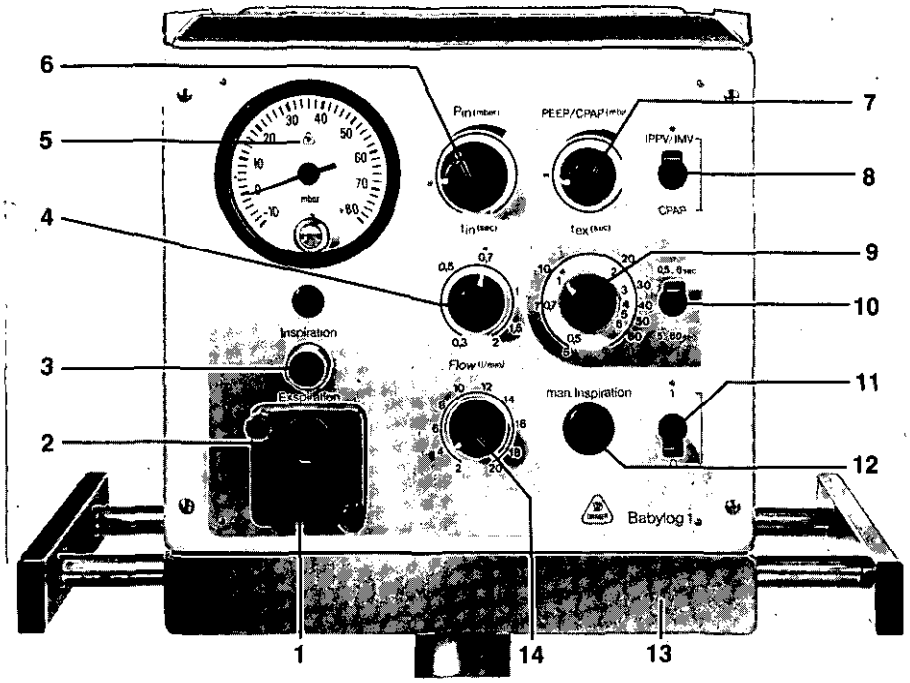

Fig. 1 Front view of Babylog 1

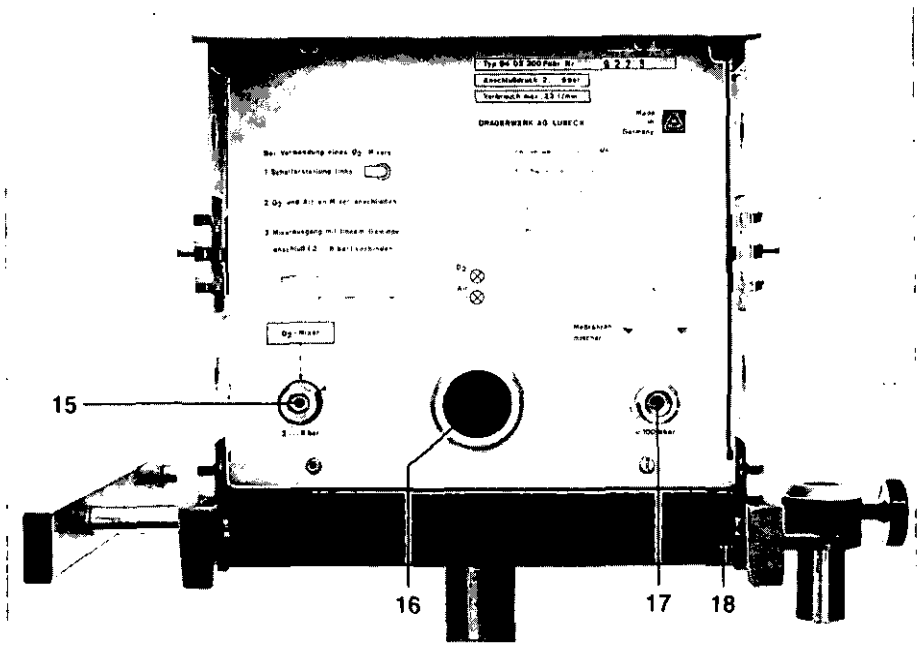

Fig. 2 Rear view of Babylog 1

Functioning Principle of Babylog 1

The Babylog 1 is a continuous-flow unit, i.e., respiratory gas flows **continuously** from the inspiratory nozzle of the Babylog 1 into the hose system (in contrast to the "intermittent operation" in a flow chopper, such as the Babylog 2), through the Y piece to the patient, and back to the expiratory valve. The inspiratory and expiratory phases are generated when the expiratory valve closes and opens.

During inspiration, the expiratory valve is actuated by a pneumatic signal of **low** pressure level. Thus auscultation is not disturbed by a sound wave caused by the pneumatic signal.

The PEEP function is also implemented by activating the expiratory valve by means of a pneumatic signal of very low pressure level (in the range of the PEEP) during the expiratory phase.

The pressure limiting valve (P_{in}) is installed *in the unit in the inspiration section so that* the patient is protected from unduly high pressure, e.g., when a hose is kinked.

Controlled ventilation – IPPV

The ventilation rate and I:E phase time ratio are provided by presetting the inspiration (t_{in}) and expiration (t_{ex}) times which can be set separately.

The frequency table shown in Fig. 13 to determine the ventilation rate and I:E ratio is located on the right side of the Babylog 1. Example: For a setting corresponding to the green dots, with t_{in} = 0.7 s and t_{ex} = 1.1 s, the ventilation rate is f = 33/min, and the breathing time ratio has the value *1:1.6. The inspiration pressure limitation* P_{in} can be varied continuously between 10 and 60 mbar, thus making it possible to set a plateau in the ventilation pressure curve or to set a safety pressure.

Flow

The flow can be set between 2 and 20 L/min. The gas flows continuously: to the patient during inspiration, through the expiratory valve to the outside during expiration. Measurement of the patient's volumetric parameters, e.g., by means of a Spirolog or volumeter, is not possible due to the continuous-flow principle.
However, the method described below *allows for easy presetting of the Babylog 1.*

Assumption:

Patient	neonate
Body weight (BW)	3 kg
Specific respiratory volume (V)	10 m L / kg BW
Ventilation rate (f)	35/min
I:E phase time ratio	1:1

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Flow setting

- Tidal volume V_T = BW × V = 30 mL
- Minute volume MV = V_T × f = 1.05 L/min
- Flow = MV × (I + E) = 1.05 × 2 = 2.1 L/min.

For a selected I:E ratio = 1:1.5, the flow is calculated as follows:
flow = 1.05 × 2.5 = 2.6 L/min.

The settings of the ventilation patterns in the Babylog 1 can be classified as follows:

1. Ventilation without assumed leakage and without pressure limitation. The calculated and set flow leads to an end inspiratory pressure at the end of the set inspiratory time, if there is no leakage. The end inspiratory pressure depends on the compliance and resistance of the patient's lungs (Fig. 3).

2. Ventilation with leakage (a ventilation gas loss of up to 50% may occur due to leakage at the tube). Any leakage results in a lower volume per breath; the end inspiratory airway pressure is reduced at the same time (Fig. 4).

3. Ventilation with higher flow setting to compensate the leakage, with inspiratory pressure limitation P_{in}. A greater flow is selected to compensate the ventilation gas losses at, for instance, the tube. In order to avoid an unwanted pressure increase at decreasing leakage, the airway pressure must thus be limited by an appropriate setting at the knob P_{in} (e.g., 20 mbar, Fig. 5).
   An end inspiratory pressure plateau is formed in the airway pressure curve (Fig. 5). Even with relatively heavy leakage, ventilation is sufficient as long as a plateau exists.

4. Ventilation in case of changes in compliance of the lungs.
   If compliance changes in the lungs have to be expected during ventilation, a different basic setting of the Babylog must be chosen. Proceed as follows:
   With deteriorating compliance, a higher airway pressure is required so that the same volume per breath can be applied.

   An attempt is thus made to obtain an airway pressure curve of the type shown in Fig. 3. In order to limit the airway pressure upwards, the pressure limit P_{in} is set about 5 to 10 mbar above the end inspiratory airway pressure.

   The setting can be checked by pressing the key **12** "Manual inspiration" (Fig. 6).

   If the airway pressure drops, this may be due to an improvement in compliance, but possibly also to leakage at the tube. In this case, proceed in the manner described in Fig. 5.

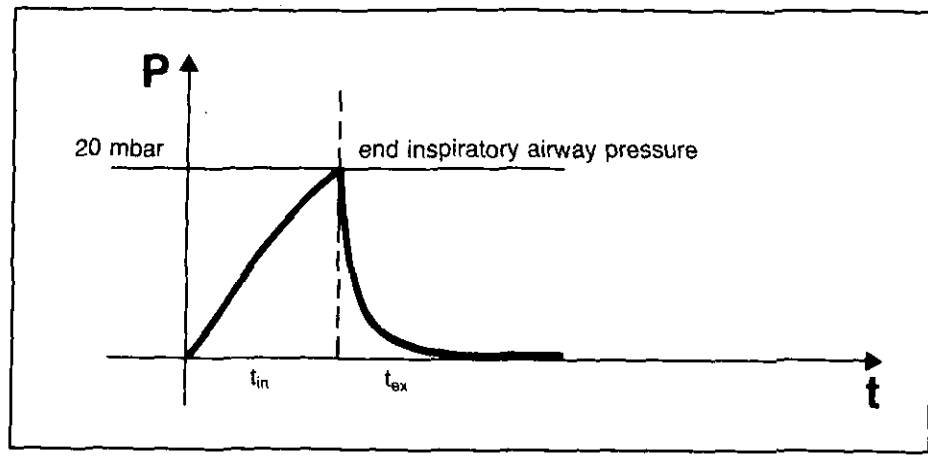

Fig. 3 Airway pressure curve for assumed setting without leakage (pressure limitation P_{in} to "max")

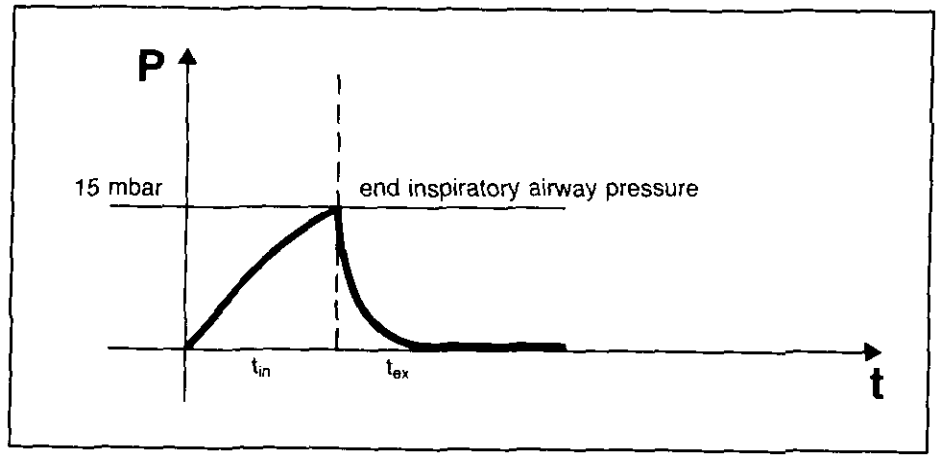

Fig. 4 Airway pressure curve with leakage (cf. Fig. 3)

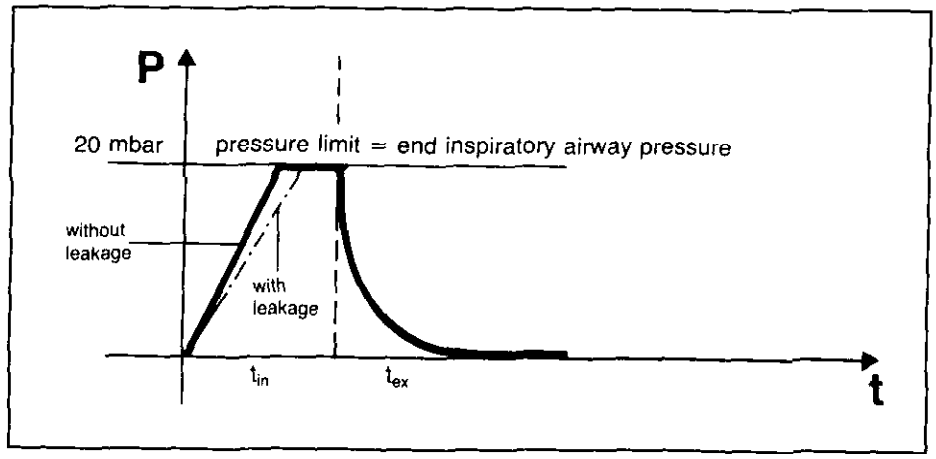

Fig. 5 Airway pressure curve with plateau (cf. Figs. 3 and 4)

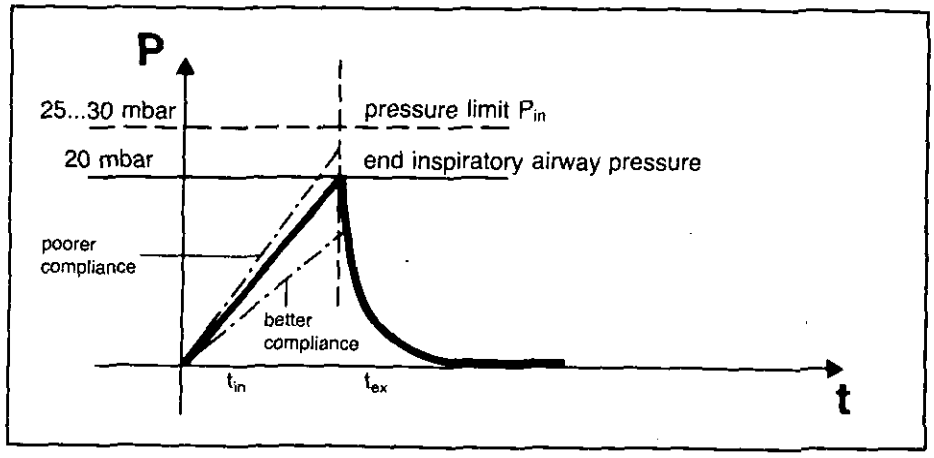

Fig. 6 Setting of the pressure limit P_{in} if changes in compliance of the lungs occur

Respirator Weaning Method IMV

The IMV method consists of the combined application of spontaneous respiration and controlled ventilation. With progressive weaning, the phases of spontaneous respiration are gradually extended, until straight spontaneous breathing (CPAP method) is possible.

Owing to the continuous-flow principle, the Babylog 1 supplies breathing gas even during the expiratory time t_{ex}. If the expiratory time t_{ex} is extended by means of the knob **9**, the patient is given progressively more time for spontaneous respiration.

At the end of the time t_{ex} for the spontaneous breathing, there is **one** controlled ventilation each time.

The parameters for the controlled ventilation are the inspiratory time t_{in} (knob **4**) and the flow (knob **14**). Since both setting variables are not changed, there is a constant mandatory tidal volume throughout the IMV weaning. This volume is applied at gradually increasing intervals (Fig. 7). The IMV rate can also be determined from Fig. 13. There is a small table at the top right, in which the assignment of the IMV rate and the set t_{ex} times is listed. A t_{in} value of 0.7 s for the mandatory tidal volume is included in the calculated IMV rate.

Spontaneous breathing with CPAP

Breathing gas flows continuously to the patient connection during spontaneous breathing (switch **8** in position CPAP), without actuating the expiratory valve.

A reference pressure acts continuously on the expiratory valve to generate a positive airway pressure (CPAP) up to about 10 mbar max. In case of spontaneous breathing with CPAP, the flow setting should be selected in such a manner that the pressure difference shown in Fig. 8 is about ΔP = 5 mbar.

Adjusting aids:

ΔP too small – flow set too high

ΔP too large – flow set too low

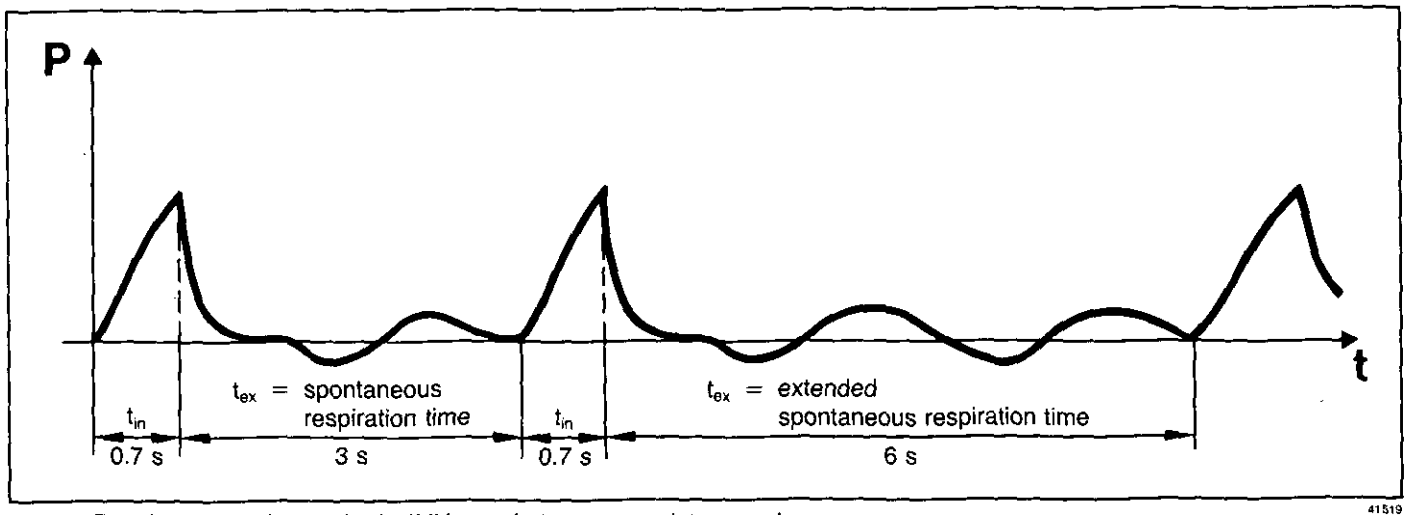

Fig. 7 Respirator weaning method – IMV

during t_{in}: mandatory stroke
during t_{ex}: spontaneous breathing

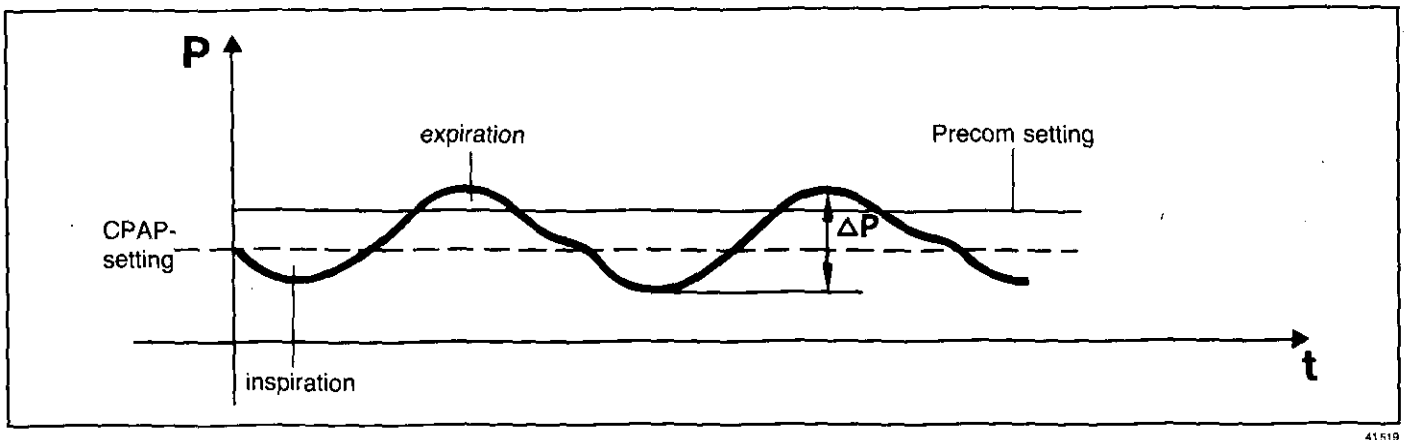

Fig. 8 Precom setting in CPAP

Initial Preparation

Gas supply

(connection of an O_2 blender):

When using the *Polymed* (Fig. 11)

- O_2 switch **16** to left position.
- Connect the blender outlet to the left screw connection **15** (2 to 6 bar).

When using the *flowmeter blender* (Fig. 12)

- O_2 switch **16** to right position.
- Connect blender outlet to the right screw connection **17** (< 100 mbar).
- Feed O_2 or compressed air to the left screw connection **15** (2 to 6 bar).

Note!

When a flowmeter blender is used (O_2 switch position **16** to the right), the flow is set **only** at the flowmeter blender. The flow knob **14** on the front of the Babylog 1 is inoperative. The O_2 concentration can be determined by means of the table attached to the blender.

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