

AutoBreath® Theory of Operation

Dräger

Technology for Life





Important notes

This document is not a replacement or substitute for the Instructions for Use issued with the medical device incorporating the AutoBreath option. It is for informational purposes only. Any use of AutoBreath or the accompanying medical device requires full understanding and observation of the Instructions for Use. The user must be familiar with the device and features according to national and local laws and recommendations.

The AutoBreath breathing circuit MUI0841 can be used to provide both automatic and non-automatic (T-piece) resuscitation. This capability allows for a seamless transition to automatic resuscitation without having to change the circuit. Use of AutoBreath breathing circuit for automatic resuscitation is discussed in this document.

The device and its accessories are not available in all countries.

AutoBreath Theory of Operation

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Figure 1:
AutoBreath Control Panel

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Figure 2: Babyroo TN300 with Resuscitation Module including AutoBreath

Support lung protective transition



Approximately 10% of newborns require some assistance to begin breathing at birth. Less than 1% require extensive resuscitation measures.¹

Resuscitation of a newborn infant in a hectic situation bears the risk of under- or overinflation of fragile lungs, but it is critical when it comes to reducing mortality and morbidity. Our goal is to reduce the number of respiratory complications that impact poor long-term outcome and preventable deaths. The respiratory support interface of our Babyroo TN300 therefore requires minimal set-up which helps you standardise your protocols and meet resuscitation guidelines to protect the infant and to ease your workflows.

- Smooth transition from T-piece to AutoBreath resuscitation with one circuit
- AutoBreath automatically delivers the desired levels of FiO₂, flow, max pressure, rate, and PEEP, freeing up the clinician's hands

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¹ Wyllie J, Perlman JM, et al., Neonatal Resuscitation Chapter Collaborators Part II: neonatal resuscitation: 2010 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Resuscitation. 2010;81 Suppl 1:e260–e287.

Theory of operation

Explaining AutoBreath

The AutoBreath option is a gas powered resuscitator for operator-attended ventilation of neonates and infants. It consists of a pneumatic oscillator and an automatic patient breathing circuit. The patient gas supply circuit consists of a 0 to 15 lpm calibrated patient gas flow, 0 to 40 +/- 5 cmH₂O adjustable airway pressure relief, a redundant, fixed airway pressure relief valve factory set to 50 ± 5 cmH₂O, and an integral airway pressure gauge. The patient breathing circuit consists of a fresh gas supply line, an expiratory valve tube, and the expiratory valve. Also, the AutoBreath option includes an adjustable PEEP feature, which allows the operator to raise the baseline expiration pressure.

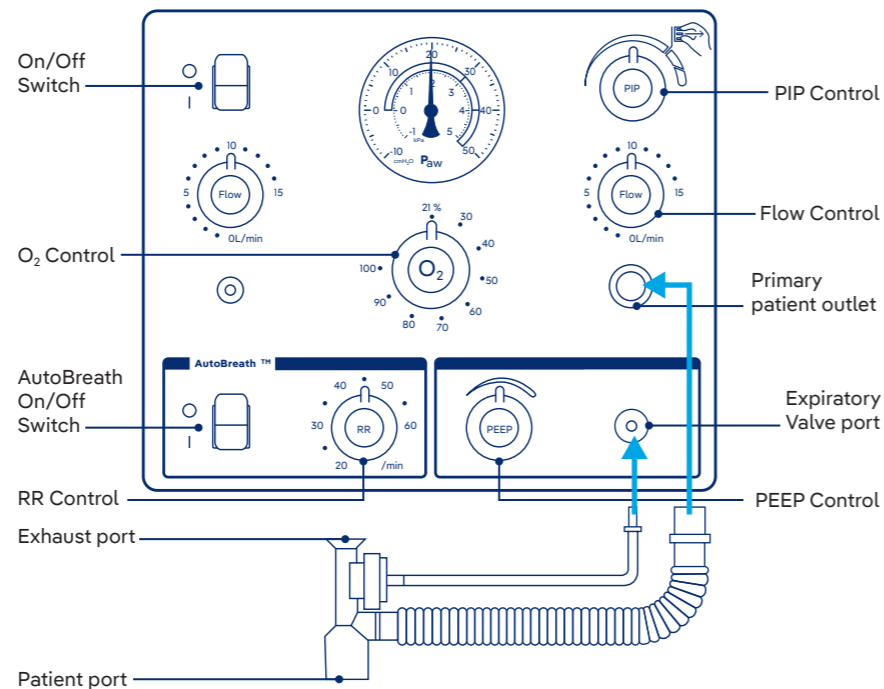


Figure 3: Connections and controls for the automatic breathing circuit

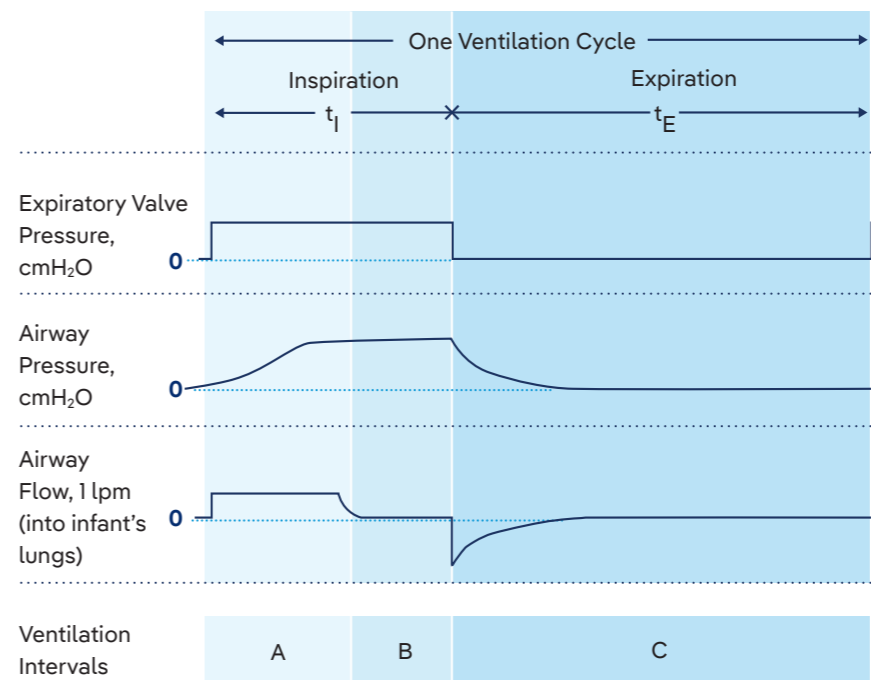


Figure 4: Ventilation Timing

Intervals of the Ventilation Cycle

Each ventilation cycle of the AutoBreath infant resuscitator consists of an inspiratory and expiratory phase. Intervals A and B, as shown in Figure 4, comprise the inspiratory phase; interval C represents the expiratory phase. The ventilation timing is independent of flow or volume. The operator sets the desired breath rate from 18 to 60 breaths per minute. The ratio of the inspiratory to expiratory phases, I:E ratio, of the AutoBreath module is fixed at 1:2.

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Control of the Ventilation Cycle, Inspiration

Ventilation Interval A

Figure 5 illustrates the state of the device during ventilation phase A. The exhaust port of the expiratory valve is blocked by the operation of the circuit and fresh gas from the Resuscitation Module is forced into the patient's lungs. As the lungs fill, the pressure in the patient airway and fresh gas supply line increases.

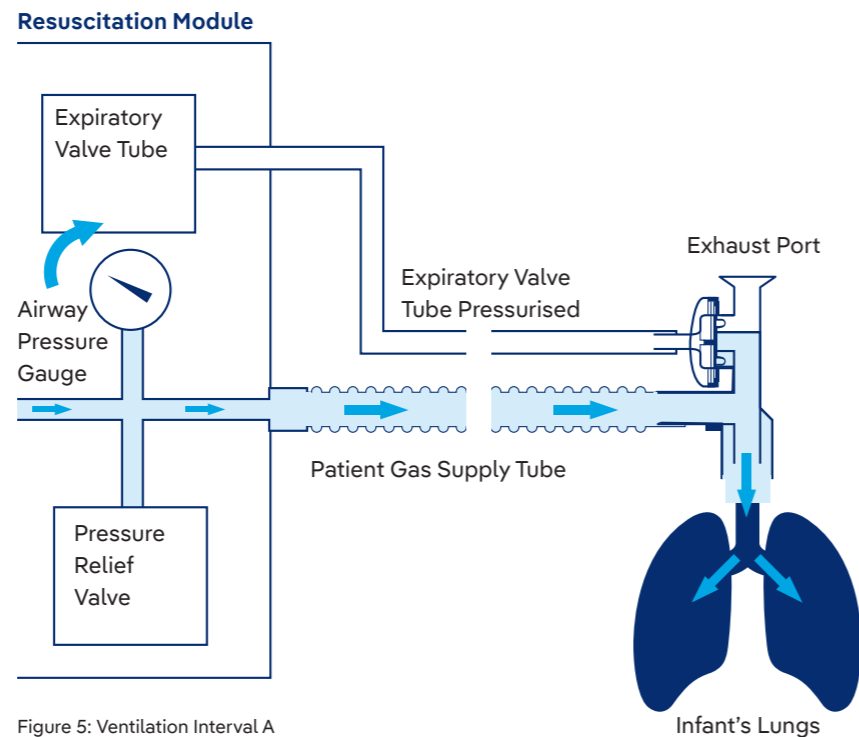


Figure 5: Ventilation Interval A

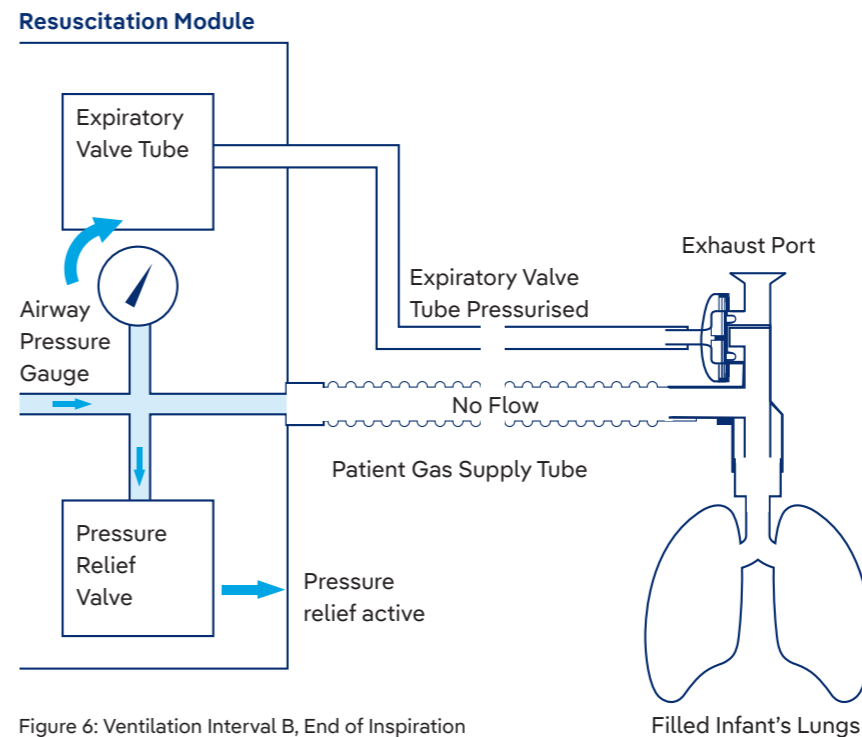


Figure 6: Ventilation Interval B, End of Inspiration

Ventilation Phase B, End of Inspiration

Once this pressure reaches the pressure setting of the adjustable pressure relief valve in the Resuscitation Module, the additional fresh gas flow is relieved by the pressure relief valve and the flow of fresh gas into the patient's lungs ceases. This is represented in interval B in Figure 4, and the state of the device is illustrated in Figure 6.

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Ventilation Interval C, Expiration

Expiration begins when the expiratory valve pressure drops to the set PEEP, which is set by the user on the AutoBreath module. During the expiratory phase, gas from the patient's lungs – as well as any gas flow from the resuscitator – vents to atmosphere. (See Figure 7 and interval C in Figure 4).

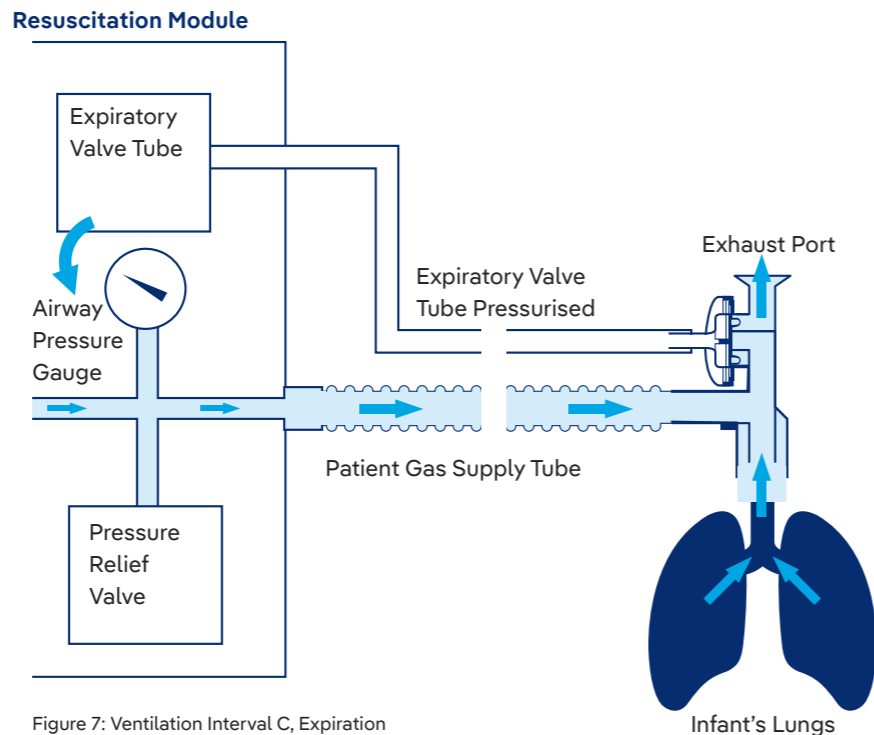


Figure 7: Ventilation Interval C, Expiration

Ventilation

In a Resuscitation Module equipped with the AutoBreath option, automatic ventilation is driven by a pneumatic oscillator circuit that pressurises the expiratory valve tube, which causes the flexible diaphragm in the expiratory valve to block the fresh gas escaping through the exhaust port.

During expiration, the expiratory valve tube from the Resuscitation Module is depressurised, thereby allowing the fresh gas, as well as gas in the patient's lungs, to flow past the diaphragm and through the exhaust port on the top of the valve housing. The frequency of the oscillator is operator adjustable from 18 to 60 breaths per minute. The I:E ratio is fixed at 1:2.

Note

The actual ventilatory flows and pressures will vary according to the following parameters:

- Patient gas flow setting (0 to 15 lpm)
- Infant lung compliance
- Infant lung capacity
- Infant airway resistance
- Airway pressure relief valve setting
- PEEP setting

PEEP

In addition to frequency control, the operator can adjust the PEEP from 0 to 14 cmH₂O. This is accomplished by allowing a slight pressure to be applied to the control diaphragm in the expiratory valve during the expiratory phase, which in turn maintains a positive pressure in the infant's lungs during expiration.



Figure 8: Babyroo TN300 front view

Theory of operation

Expiratory Valve Description

The expiratory valve shown in Figure 9 is attached to a breathing mask or endotracheal tube held snugly to the patient's face. The flange at the exhaust port forms a platform for the operator's finger or thumb and prevents the attachment of additional tubing or apparatus that could increase the exhaust flow resistance.

Pneumatic Patient Gas Supply Circuit

The patient gas supply circuit consists of a 0 to 15 lpm calibrated patient gas flow valve, a 0 to 40 +/- 5 cmH₂O adjustable airway pressure relief valve, a redundant fixed airway pressure relief valve set at the factory to 50 ± 5 cm H₂O, and an integral airway pressure gauge.

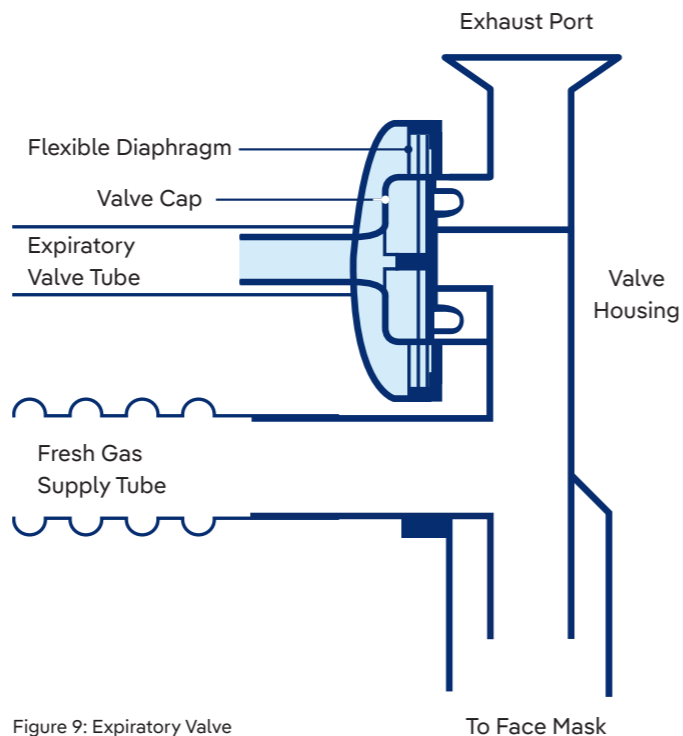


Figure 9: Expiratory Valve

AutoBreath - Deliver the right breath rates

Provide consistent care.

AutoBreath keeps a consistent respiratory rate and shows the applied inflation pressure on the Resuscitation Module.

Enhance your delivery of ventilation.

AutoBreath frees your hands to seal and secure the face mask and thus helps to stabilise ventilation. This is especially helpful in hectic situations or during intra-hospital transfers when your patient needs further respiratory support after initial stabilisation.

Only one circuit needed.

The same circuit can be used for T-piece and AutoBreath function.



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