

# PHILIPS

sense and simplicity



## Trilogu™ Effizient & Vielseitig

- ✓ Beatmungsmodi
- ✓ Alarme und Einstellungen
- ✓ Schlauchsysteme
- ✓ Respiroics Technologien

## ENDLICH...

Alle Respiration Technologies  
in einem Life-Support Beatmungsgerät



- Auto-TRAK™ Algorithmus für optimale Trigger Sensitivität
- AVAPS™ Hybrid Beatmung in allen Druckmodi
- Fortschrittliche Leckagekompensation in allen Druck- und Volumenmodi
- Invasive und nicht-invasive Beatmung mit aktivem Ventil mit Steuerschläuchen ODER mit passivem Ausatemventil

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## Trilogy™

**Beatmungsmodi**  
**Alarmer & Einstellungen**  
**Schlauchsysteme**

# Trilogy Beatmungsmodi

## Druckmodi

- ✓ CPAP
- ✓ S\*
- ✓ S/T\*
- ✓ PC\*
- ✓ T\*
- ✓ PC- SIMV\*

## Volumenmodi

- ✓ AC
- ✓ VC
- ✓ SIMV

## Passives Ausatemventil

AVAPS\* & Auto-TRAK

Auto-TRAK

## Aktives Ausatemventil mit Steuerschläuchen

**Für Erwachsene und Kinder / invasiv and nicht-invasiv**

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## Beatmungsmodi

Für Hintergrund-Informationen pro Modus hier klicken



## Druckmodi

### CPAP, S

CPAP: 4 – 20 cmH<sub>2</sub>O

IPAP: 0 – 50 cmH<sub>2</sub>O

EPAP: 4/0 – 25 cmH<sub>2</sub>O

Flex : aus, 1, 2, 3\*

Rampe: aus, 5 – 45 min

Anfangsdruck: 4 - EPAP

\* Nur mit aktiviertem Auto-Trak

### S/T, PC, T

IPAP: 0 – 50 cmH<sub>2</sub>O

EPAP: 4/0 – 25 cmH<sub>2</sub>O

RR: 0 – 60 BPM

Ti: 0,3 – 5 sek.

Rampe: aus, 5 – 45 min

Anfangsdruck : 4 – EPAP

### PC-SIMV

**Mandatorische oder assistierte Hübe:**

Druck: 0 – 50 cmH<sub>2</sub>O

PEEP: 4/0 – 25 cmH<sub>2</sub>O

RR: 0 – 60 BPM

Ti: 0,3 – 5 sek.

**Spontane Atemzüge:**

Pressure support : 0 – 30 cmH<sub>2</sub>O

## Volumenmodi

### VC, AC

Vt: 50 - 2 000 ml

Flowverlauf: Rechteck - Rampe

EPAP: 4/0 - 25 cmH<sub>2</sub>O

RR: 0 - 60 BPM

Ti: 0- 60 BPM

### SIMV

**Mandatorische oder assistierte Hübe:**

Vt: 50 - 2 000 ml

Flowverlauf: Rechteck - Rampe

PEP: 4/0 - 25 cmH<sub>2</sub>O

RR: 0 - 60 BPM

Ti: 0- 60 BPM

**Spontane Atemzüge:**

Pressure support: 0 – 30 cmH<sub>2</sub>O

Seufzer:

- Ein, Aus
- 150% des aktuellen Vt bei jedem 100. Atemzug

# Beatmungsmodi im Vergleich zu VS Ultra

## Ultra

|                      |   |     |       |    |                     |        |     |       |       |       |
|----------------------|---|-----|-------|----|---------------------|--------|-----|-------|-------|-------|
| <b>Passive Valve</b> |   |     |       |    | <b>Active Valve</b> |        |     |       |       |       |
| S/ST                 |   |     | (A)PC |    | <b>PSV</b>          | (A)PCV |     | (A)CV |       | PS.TV |
| CPAP                 | S | S/T | (A)PC | PC | <b>PSV</b>          | (A)PCV | PCV | CV    | (A)CV | PS.TV |

## Trilogy

|                      |   |     |    |   |            |    |   |    |    |               |      |         |
|----------------------|---|-----|----|---|------------|----|---|----|----|---------------|------|---------|
| <b>Active Valve</b>  |   |     |    |   |            |    |   |    |    |               |      |         |
| <b>Passive Valve</b> |   |     |    |   |            |    |   |    |    |               |      |         |
| CPAP                 | S | S/T | PC | T | <b>S/T</b> | PC | T | CV | AC | S, S/T, PC, T | SIMV | PC-SIMV |
| AVAPS                |   |     |    |   | AVAPS      |    |   |    |    |               |      |         |

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# Patienten-Alarme

|                                  | Druckmodi |   |     |    |   |         | Volumenmodi |    |      |
|----------------------------------|-----------|---|-----|----|---|---------|-------------|----|------|
|                                  | CPAP      | S | S/T | PC | T | PC-SIMV | CV          | AC | SIMV |
| Circuit Disconnect: off, 0-60sec |           |   |     |    |   |         |             |    |      |
| Apnoe*: aus, 0-60sec             |           |   |     |    |   |         |             |    |      |
| Apnoe Rate*: RR - 60 BPM         |           |   |     |    |   |         |             |    |      |
| Hohes/Niedr. Tidalvolumen        |           |   |     |    |   |         |             |    |      |
| Hohe/Niedr. Minutenvolumen       |           |   |     |    |   |         |             |    |      |
| Hohe/Niedr. Atemfrequenz         |           |   |     |    |   |         |             |    |      |
| Hoher/Niedr. Peak Insp.Druck     |           |   |     |    |   |         |             |    |      |

**\* Apnoe Beatmung:**

- Einstellen des Apnoe-Alarm und Apnoe-Rate
- Alarm nach x sek. und Beginn der mandatorischen Beatmung mit fester Hintergrundfrequenz (= Apnoe Rate)

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## System-Alarme und Hinweise

- ✓ Hoher/Niedr. Druck (Nur in Druckmodi)
- ✓ Kleines Leck im Schlauchsystem (Passives Ausatemventil)
- ✓ Energie / Batterie Alarme
- ✓ Schlauchsystem prüfen
- ✓ Beatmungsgerät außer Betrieb
- ✓ Wartung Beatmungsgerät empfohlen

Hohe Priorität – **ROT**

Mittlere Priorität – **GELB**

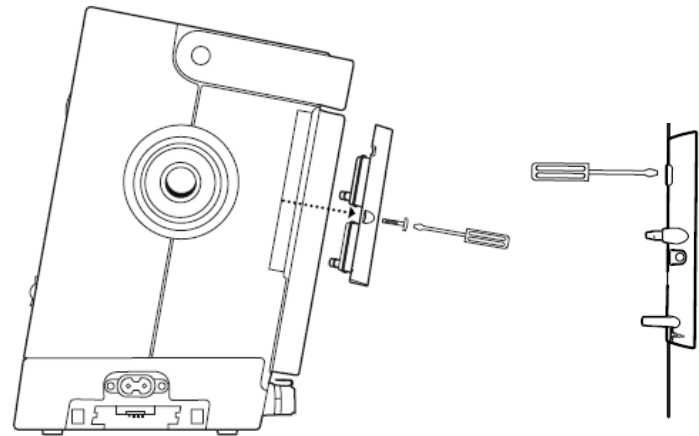
Informationsmeldung – farblos

## Schlauchsysteme

- Passives Ausatemventil
  - Auto-TRAK™
  - AVAPS™
- Aktives Ausatemventil mit Steuerschläuchen

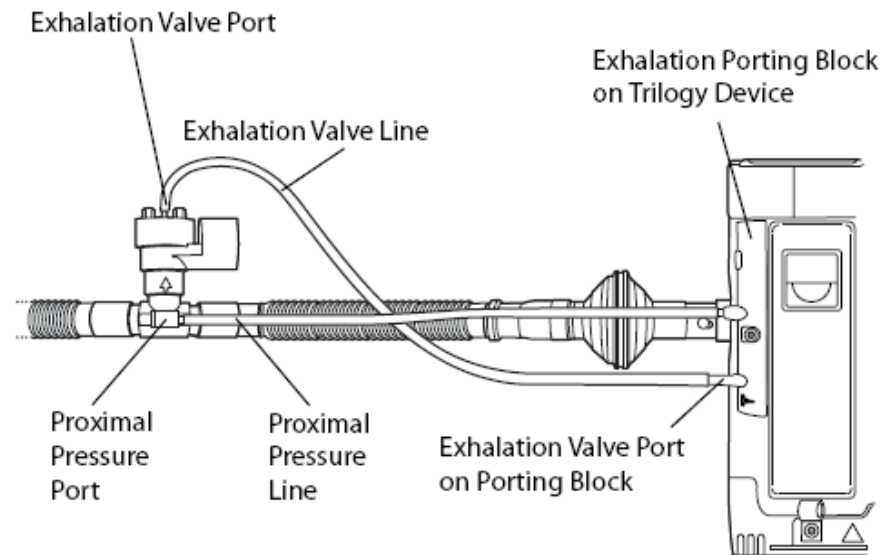


- ⇒ Beide geeignet für invasive und nicht-invasive Beatmung
- ⇒ Beide geeignet für Volumen- und Druckmodi



## Aktives Ausatemventil mit Steuerschläuchen

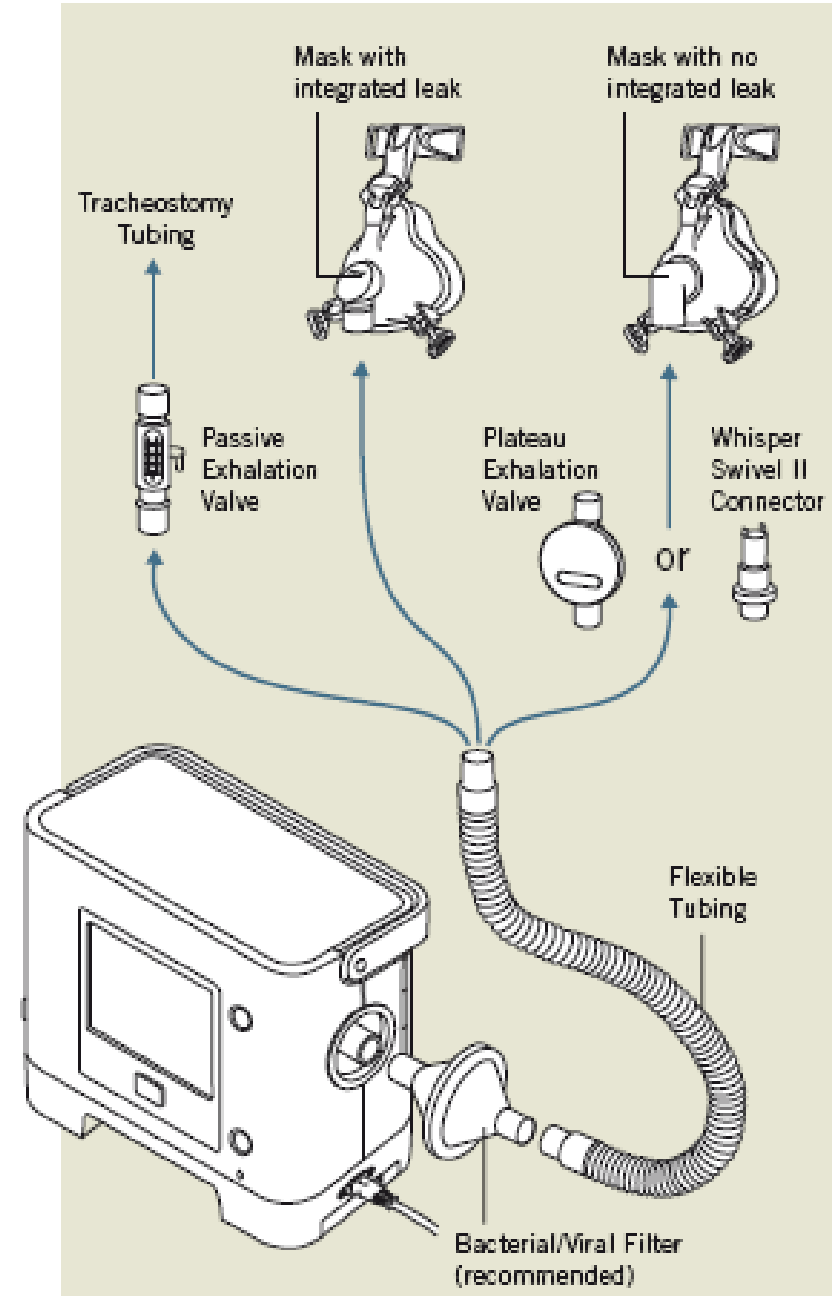
- 1-Schlauch-System
- Respironics aktives Ausatemventil
- Monitoring: Vi/Vti Messung
- Volumen- und Druckmodi (PEEP = 0-25 cmH<sub>2</sub>O)
- Invasive und nicht-invasive Beatmung



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# Passives Ausatemventil

- 1-Schlauchsystem
  - Maske mit Ausatemventil
  - SE-Maske und Whisper Swivel
  - Tracheostoma und Whisper Swivel
- Einschlauchsystem
  - Einfach zu reinigen
  - Keine fehleranfälligen Steuerschläuche
  - Kein Geräusch vom Ventil
  - Günstiger in den Folgekosten
- Min. EPAP von 4 cmH<sub>2</sub>O



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## Passives Ausatemventil



- Invasive und nicht-invasive Beatmung
- Bewährte RespiRics Technologien
  - Leckage-Kompensation in Druck- und Volumenmodi
  - “Auto-Trak” in Druck- und Volumenmodi
  - Monitoring:  $V_e/V_{te}$  Kalkulation
  - AVAPS in allen Druckmodi (außer CPAP)
- Min. EPAP von  $4\text{cmH}_2\text{O}$

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## Respironics Technologien

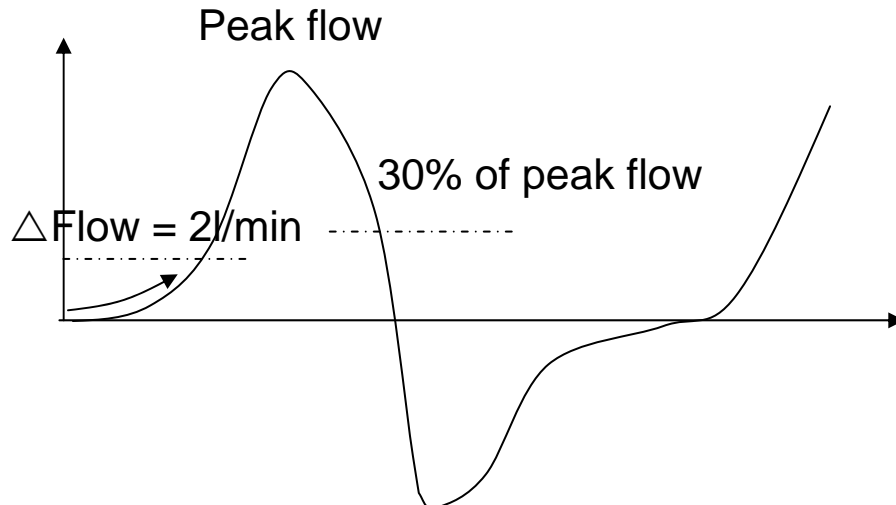
- ✓ Auto-TRAK™
- ✓ AVAPS™
- ✓ Volumenmodi & Leckage Kompensation

## Flow Trigger

- Mit aktivem und passivem Ventil.
- Volumen- und Druckmodi
- nicht-invasiv und invasiv
- Insp. Trigger Sensitivität: 1 – 9 l/min
- Exsp. Trigger Sensitivität: 10 – 40% des Spitzenfluss

## Auto-TRAK Trigger

- NUR passives Ventil
- Volumen- und Druckmodi
- nicht-invasiv und invasiv
- Automatischer Trigger



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## Auto-Trak™ Sensitivity

«Anders als bei manuell einzustellenden Triggern  
nimmt Ihnen Auto-TRAK diese Arbeit ab.»

### Eigenschaften

- **Automatischer Trigger**
- **Überlegene Leckage-Kompensation** über 60LPM
- **Vte/Ve Kalkulation** mit hoher Genauigkeit (15lpm, 15%)

### Vorteile

- **Effiziente Beatmung:** Kompensation auch grosser Leckagen.  
Automatische Anpassung der Triggerschwellen.
- **Einfache Beatmung:** keine Trigger-Nachbesserung nötig
- **Überlegenes Monitoring:** Alarme & Monitoring des Vte & MinVent

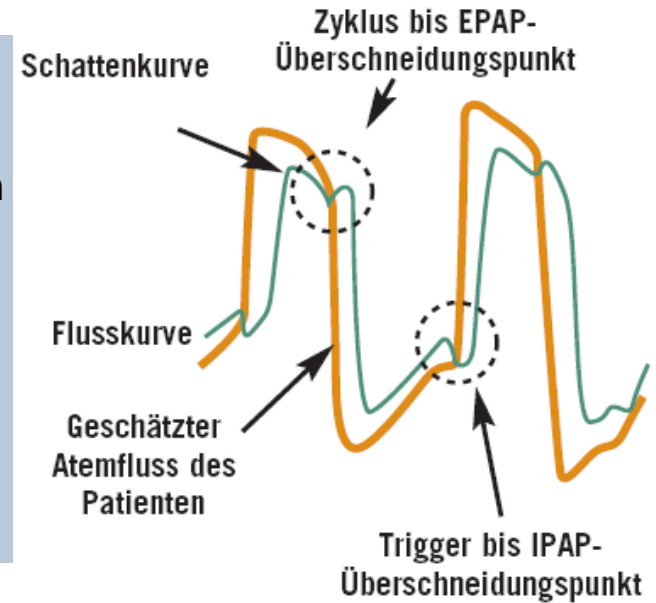


# Digital Auto-TRAK Algorithmus

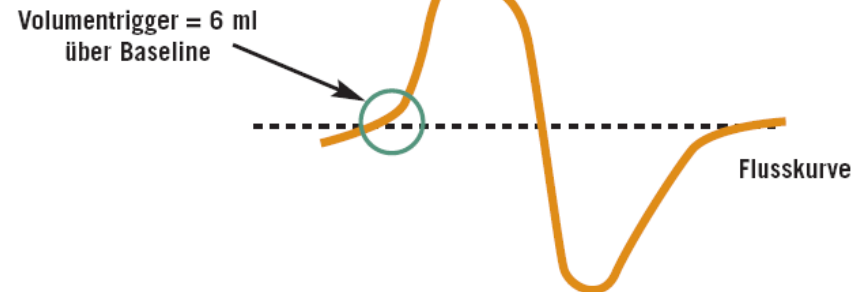
- **Inspiration:** bei Einatembemühungen des Patienten steigt der Flow.
- **Expiration:** bei Ausatembemühungen des Patienten reduziert sich der Flow.

## Schattensignal:

Die zeit-verzögerte Kurve kreuzt den Patientenflow beim Richtungswechsel -> Umschalt-  
punkt



Erkennen eines Volumens von 6ml über der Baseline



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## Digital Auto-TRAK Algorithmus

### SET:

Elektronisch generiertes Signal, das proportional mit dem Flowanstieg ansteigt.

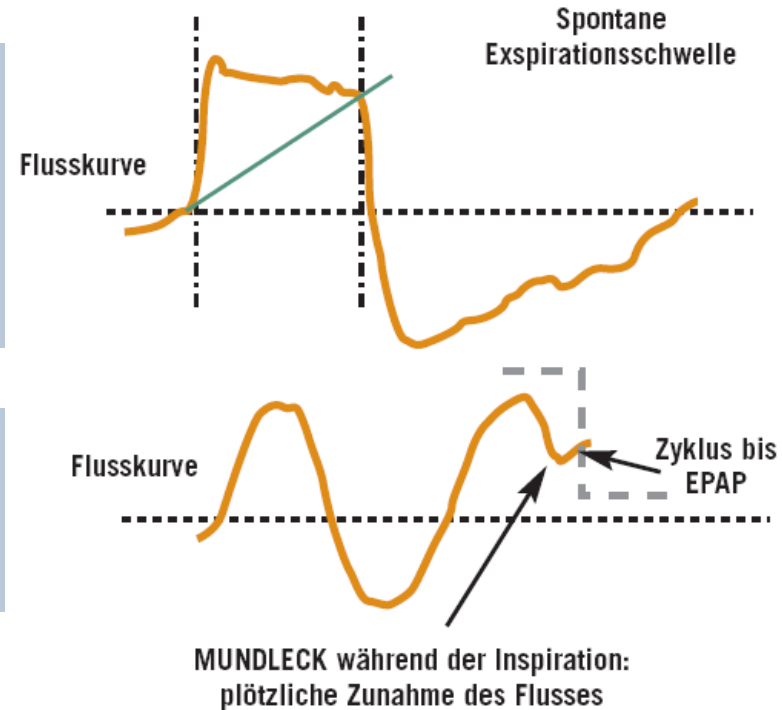
SET passt sich dem Flowmuster und damit der Atemphysiologie des Patienten an

### Flußumkehrung:

Erkennt grosse Mundleckagen. Umschalten auf EPAP bei einem plötzlichen Flowanstieg über 10% des Peakflow.

### Sicherheitsumschaltung:

Umschalten von Inspiration auf Exspiration nach 5 sek.



# Digital Auto-TRAK™ Sensitivität

«Eine bewährte Technologie»

- **Chest 1997** : “Performance Characteristics of Bilevel Pressure Ventilators” Kacmarek and Co.
- **AJRCCM 2001** : “Noninvasive Ventilator Triggering in Chronic Obstructive Pulmonary Disease” Moxham and Co.
- **Chest 2005** : “Performance Characteristics of 10 Home Mechanical Ventilators in Pressure-Support Mode” Janssens and Co.

# Digital Auto-TRAK™ Sensitivität

“Die Synchronität von Patient und Beatmungsgerät ist ein Schlüssel zum Erfolg einer langzeit-Heimbeatmung (NIV), da Dys-Synchronität zu Intoleranz des Patienten führt.”

**Chest 2005** : “Performance Characteristics of 10 Home Mechanical Ventilators in Pressure-Support Mode”

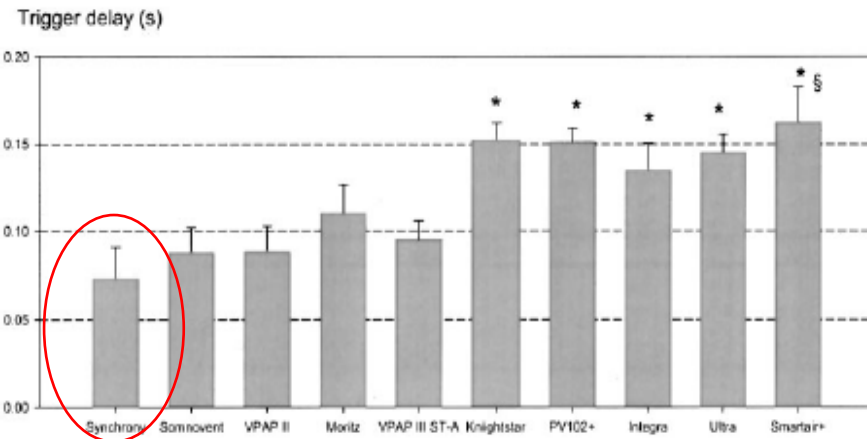


FIGURE 2. Td of the 10 bilevel ventilation devices, tested for an inspiratory effort of 5 cm H<sub>2</sub>O. Data pooled for the three levels of pressure support (10, 15 cm H<sub>2</sub>O and PSmax). Histogram bars mean ± SD. \* = p < 0.05 vs the Moritz, Synchrony, Somnovent, VPAP II, and VPAP III ST-A devices; § = p < 0.05 vs the Integre and Ultra devices.

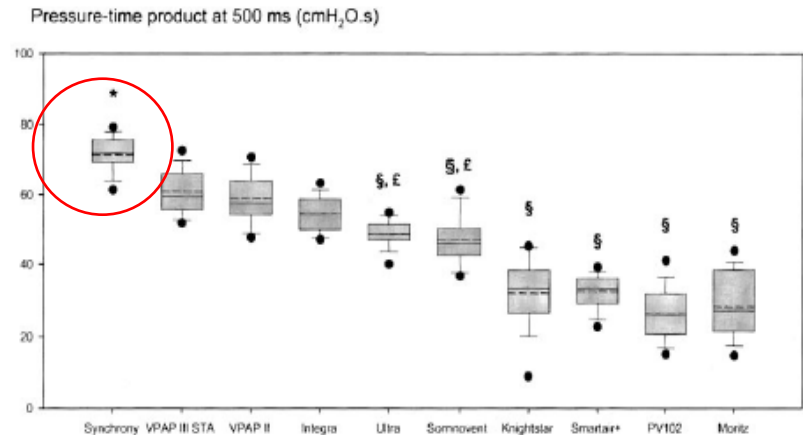
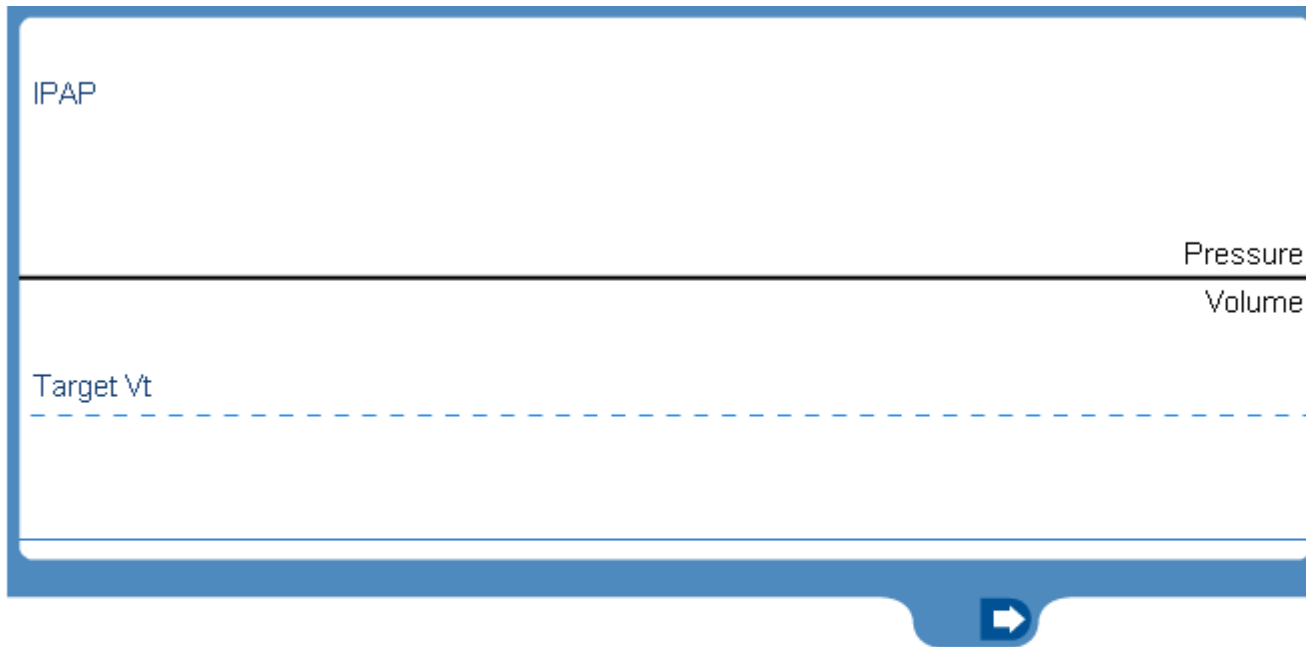


FIGURE 5. PTP<sub>500</sub> values for the 10 bilevel ventilation devices. The data were pooled for all conditions. Box and whisker plots show the mean values (dashed lines in the boxes), the median values (continuous lines in the boxes), 25th to 75th percentiles (vertical bars), and 5th to 95th percentiles (dots). \* = p < 0.05 vs all other devices; § = p < 0.05 vs the Integre, VPAP II, and VPAP III ST-A devices; £ = p < 0.05 vs the Knightstar, Moritz, PV 102, and SmartAir+ devices.

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## AVAPS

AVAPS passt automatisch die Druckunterstützung an, um ein durchschnittliches Mindestvolumen zu garantieren.



**AVAPS is the first technology to combine pressure support and volume ventilation to effectively manage the patient's therapy.**

**Under "normal" conditions, a constant pressure will provide adequate tidal volume to the patient.**

## AVAPS Vorteile

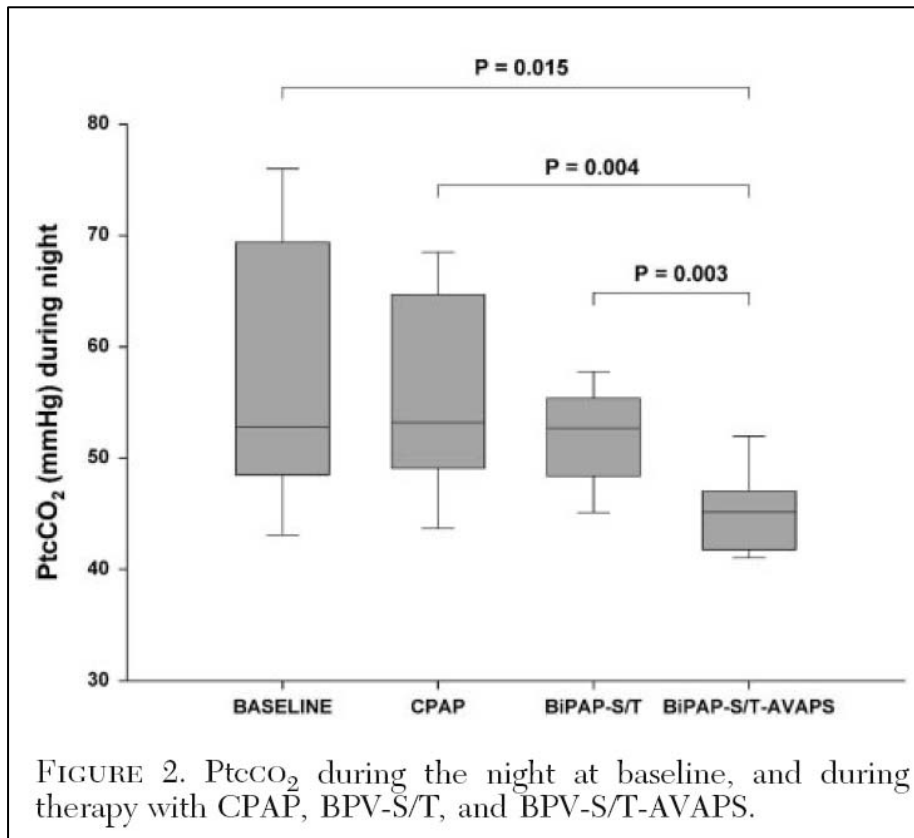
- Verbesserung der Schlafqualität, da das Vt sich in über Schlafstadien ändert.
- **Obesitas Hypoventilation:** Kompensieren von Lunden-Complianceänderungen z.B. bei Körperlageänderungen
- **COPD Patienten & Restriktive Patienten:**
  - Das Beste der Druck- und Volumenmodi: Effizienz und Comfort durch den richtigen Druck zur richtigen Zeit.
  - Besserer Comfort bei höchster Beatmungssicherheit.

**« Der richtige Druck zur richtigen Zeit. »**

# “Average Volume Assured Pressure Support in Obesity Hypoventilation: a Randomized Cross-Over Trial”

Jan Hendrik Storre, MD; Benjamin Seuthe; René Fiechter, MD; Stavroula Milioglou; Michael Dreher, MD; Stephan Sorichter, MD; and Wolfram Windisch, MD

CHEST, September 2006



**“BiPAP ST MIT AVAPS** bietet physiologische Vorteile die im Vergleich zu einfachem BiPAP ST zu einer **verbesserten Reduzierung des PtcCO<sub>2</sub>** führen.”

- Druckanpassung zur Sicherstellung eines durchschnittlichen Tidalvolumens und damit zur Reduzierung des CO<sub>2</sub>
- Druckanpassung bei Änderung der Körperlage
- Druckanpassung bei Änderung des Schlafstadiums

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# AVAPS Einstellungen

Empfohlene Starteinstellung:

- ✓ EPAP = 4 (ohne overlap mit SBAS oder intrinsic PEEP)
- ✓ IPAPmin = EPAP + 4
- ✓ IPAPmax = 25 cmH<sub>2</sub>O oder mehr
- ✓ Vt = 8 ml/kg des idealen Gewichtes

## > AVAPS™ – EMPFOHLENE EINSTELLUNGEN

### 1. Einstellen des Soll-Tidalvolumens:

Hinweis: Das Soll-Vte kann auf 200 ml bis 1500 ml eingestellt werden.

- auf das angezeigte Tidalvolumen des Patienten bei Beatmung im S/T-Modus



oder

- auf 8 ml/kg des Idealgewichts\* und Anpassen gemäß Patiententoleranz und klinischen Ergebnissen

### 2. Einstellen der IPAP-Grenzwerte:

- IPAP max. = 25 bis 30 cm H<sub>2</sub>O je nach Krankheitsbild des Patienten



- IPAP min. = EPAP + 4 cm H<sub>2</sub>O

> Überprüfen der arteriellen Blutgase (PaCO<sub>2</sub> und PaO<sub>2</sub>) und Sauerstoffsättigung (SpO<sub>2</sub>) des Patienten

| Größe  | Berechnetes Idealgewicht (bei BMI = 23) | Soll-Vte bei 8 ml/kg | Soll-Vte bei 10 ml/kg |
|--------|---|----------------------|-----------------------|
| 1,50 m | 52,0 kg                                 | 410 ml               | 520 ml                |
| 1,55 m | 55,0 kg                                 | 440 ml               | 550 ml                |
| 1,60 m | 59,0 kg                                 | 470 ml               | 590 ml                |
| 1,65 m | 62,5 kg                                 | 500 ml               | 620 ml                |
| 1,70 m | 66,5 kg                                 | 530 ml               | 660 ml                |
| 1,75 m | 70,5 kg                                 | 560 ml               | 700 ml                |
| 1,80 m | 74,5 kg                                 | 600 ml               | 740 ml                |
| 1,85 m | 78,5 kg                                 | 630 ml               | 780 ml                |
| 1,90 m | 83,0 kg                                 | 660 ml               | 830 ml                |

Die obigen Daten wurden auf Basis eines idealen Body-Mass-Index von 23 kg/m<sup>2</sup> (BMI = Gewicht/Größe<sup>2</sup>) berechnet.

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# Volume mode & Leak Compensation

- In Passive exhalation port circuit configuration



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## **Beschreibung Beatmungsmodi**



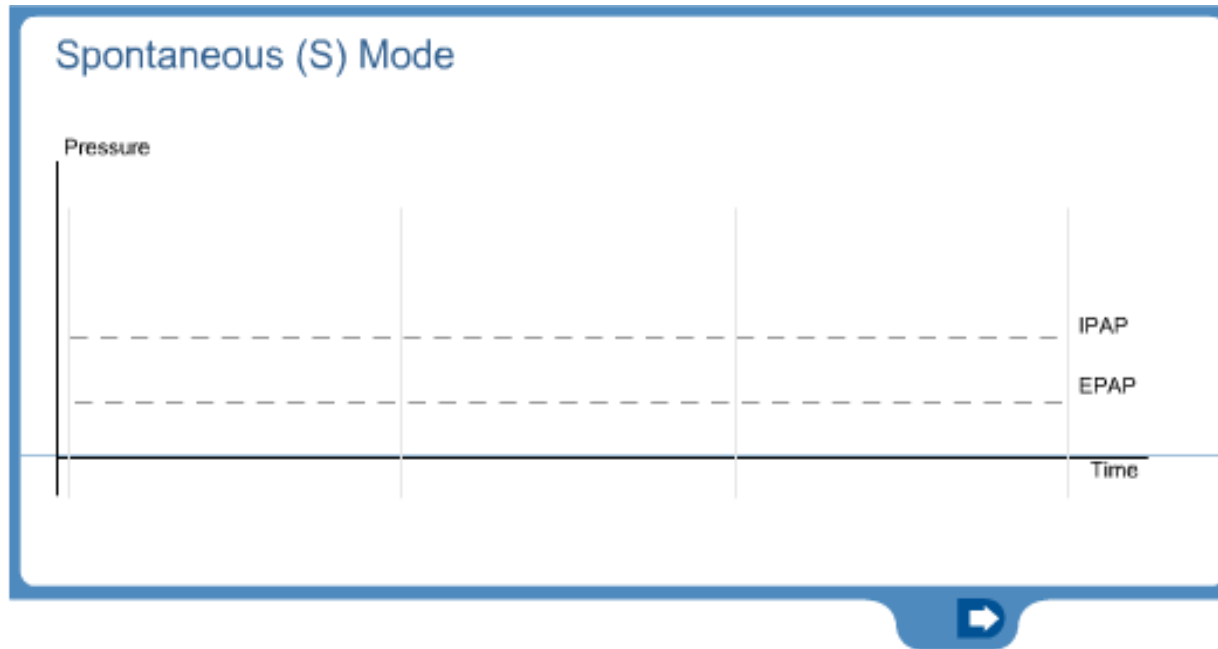
# Grundlagen

- Spontane Hübe:
  - Patient triggert Inspiration und Expiration
  - Einstellung: IPAP and EPAP
- Assistierte Hübe:
  - Patient triggert Inspiration, das Gerät die Expiration
  - Einstellungen Druckmodi: IPAP, EPAP, Ti
  - Einstellung Volumenmodi: Vt, Ti
- Mandatorische Hübe:
  - Gerät triggert Inspiration und Expiration
  - Einstellung Druckmodi: IPAP, EPAP, Ti, RR
  - Einstellung Volumenmodi: Vt, Ti, RR



# BiPAP S

Alle Atemzüge sind spontan vom Patienten getriggert.



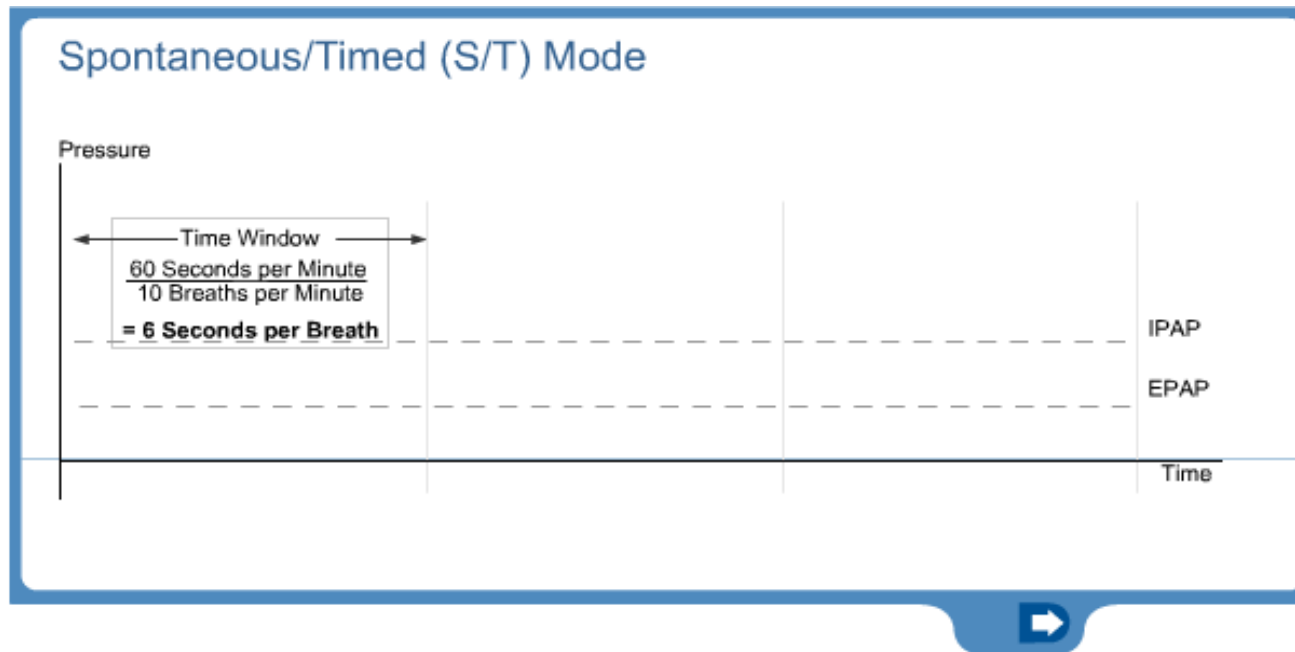
**In the Spontaneous (S) mode, the Trilogy® delivers bi-level pressure support, based on the IPAP and EPAP settings.**



## BiPAP S/T

Alle Atemzüge sind spontan vom Patienten getriggert.

Atmet der Patient nicht spontan, dann erfolgen mandatorische Hübe.

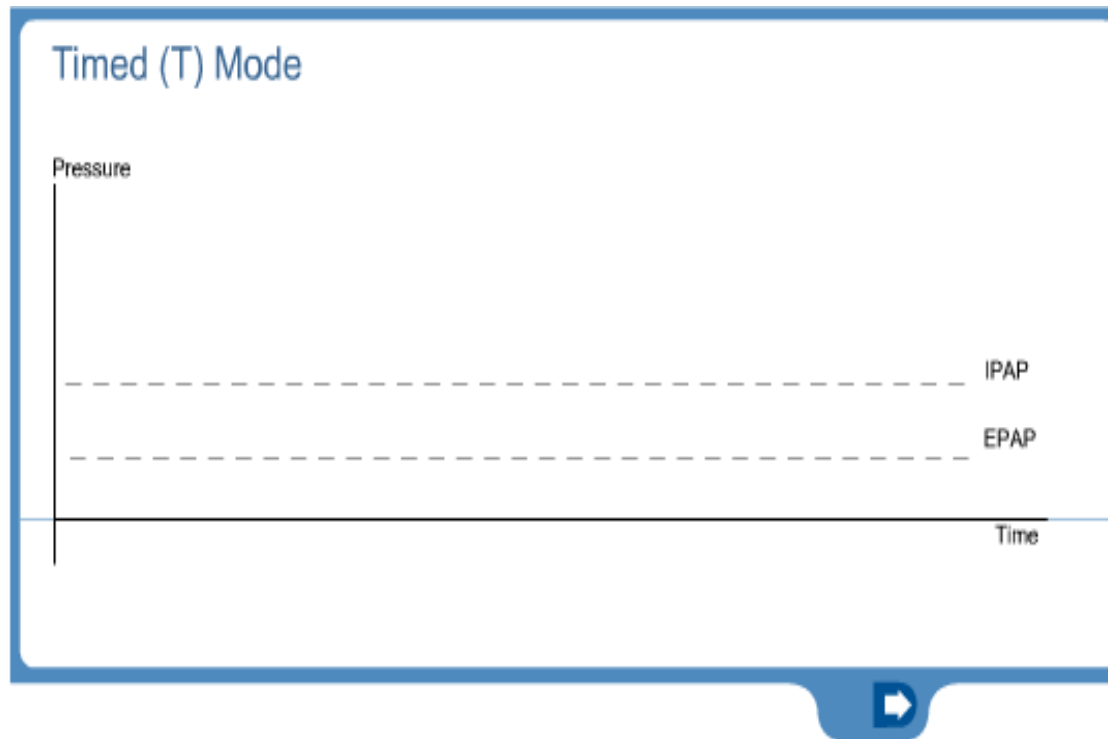


**S/T Mode is similar to S Mode, but a "Time Window" is added. The length of the Time Window is determined by dividing 60 seconds by the Rate. This value represents the minimum "seconds per breath" to be delivered.**



# BiPAP T

Druckunterstützte Beatmung mit mandatorischen Hüben.

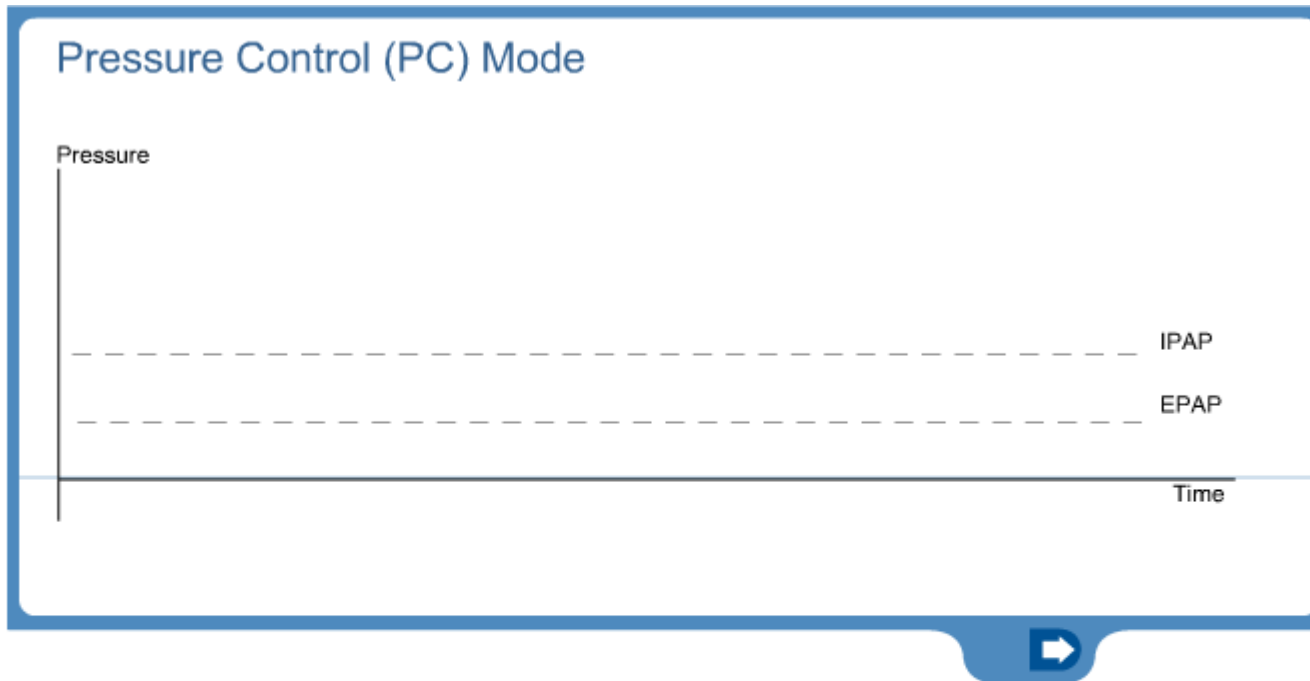


The Timed Therapy (T) mode provides mandatory pressure assist with bi-level pressures. All breaths are machine-triggered and machine-cycled; the patient's breathing rate has no effect on the machine rate or pressure levels.



# Druckkontrollierte Beatmung (PC)

- Liefert assistierte und mandatorische Hübe mit einem vorgegebenen Druck.

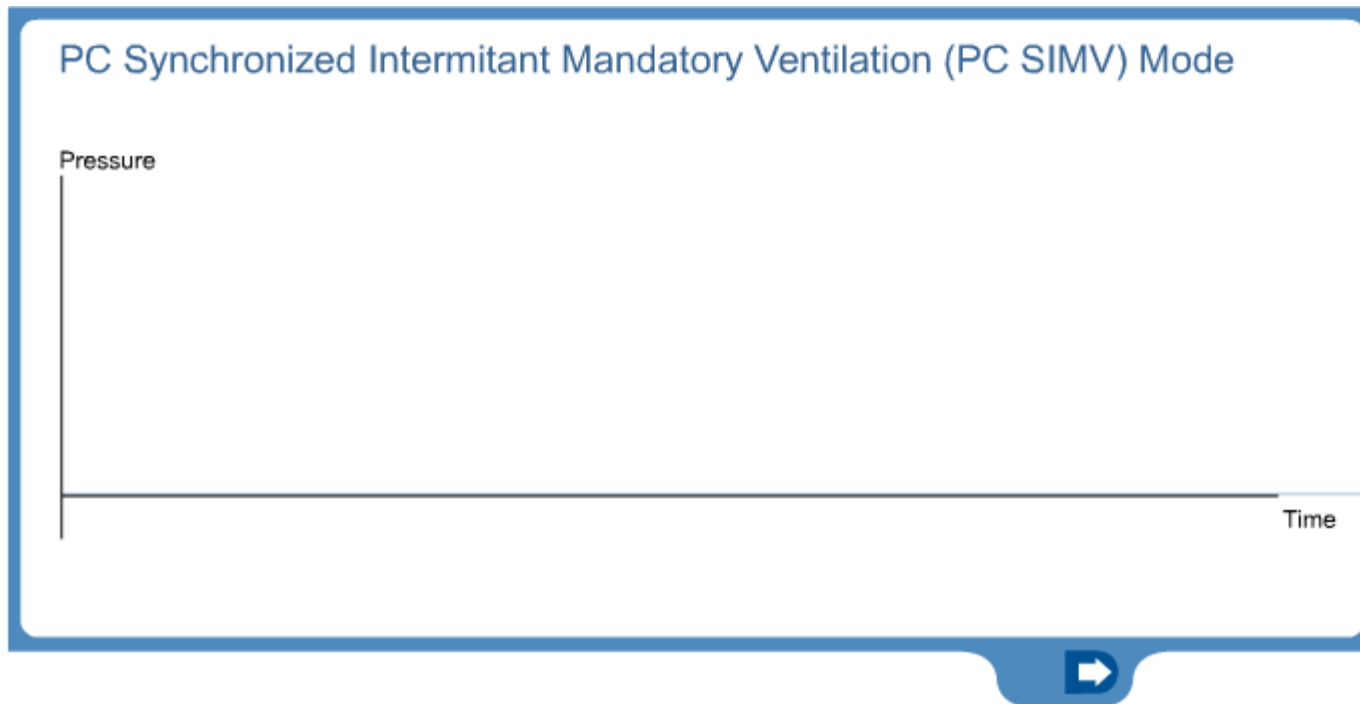


**Pressure Controlled (PC) Mode is similar to S/T Mode in that all breaths can be patient- or machine-triggered**



# Synchronized Intermittent Mandatory Ventilation (PC-SIMV)

- Unterstützt spontane, assistierte und mandatorische Hübe.

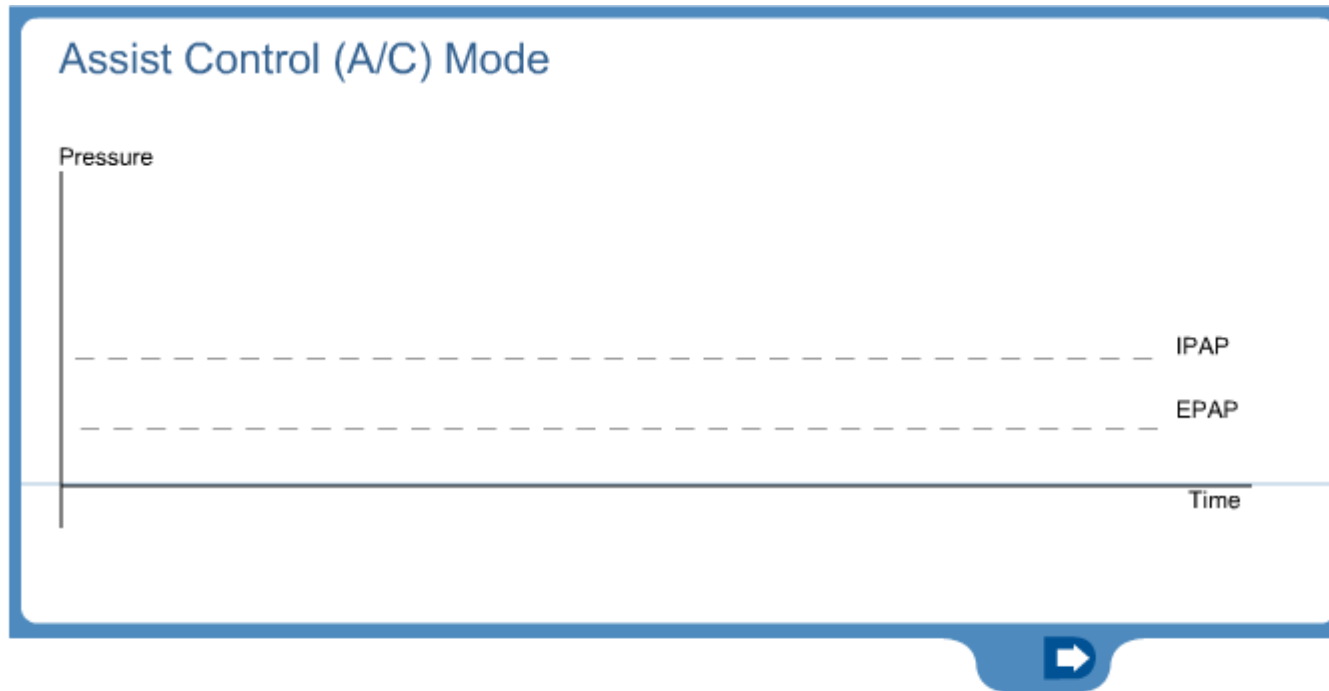


In PC SIMV mode, breaths can be patient-triggered or ventilator-initiated. If the patient is not triggering breaths, the ventilator delivers Mandatory breaths at the designated pressure set. If the patient triggers a breath, the ventilator delivers an Assist breath or a Spontaneous breath, based on when the breath is triggered.



# Volumen Assistierte Beatmung (AC)

- Unterstützt assistierte und mandatorische Hübe mit vordefiniertem Volumen.

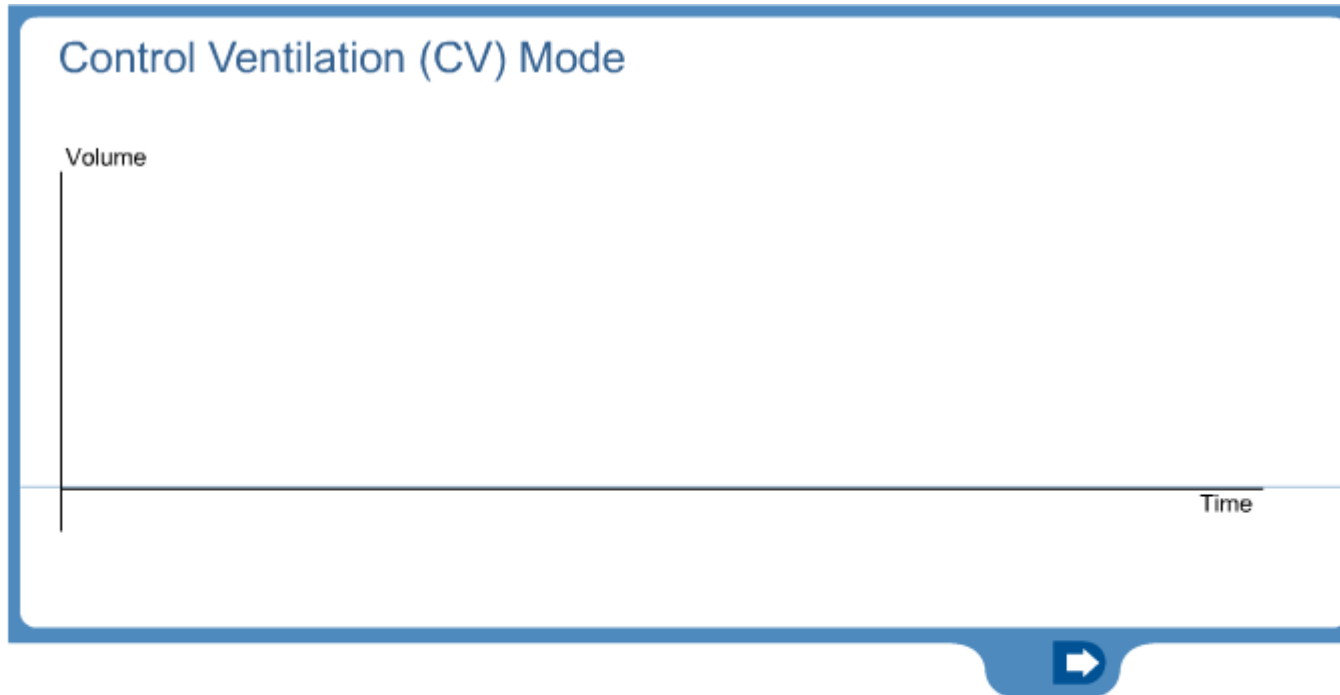


**In A/C mode, breaths may be either patient-triggered or ventilator-initiated, but the ventilator is in complete control of how the breath is delivered.**



# Volumen Kontrollierte Beatmung (CV)

- Liefert mandatorische Hübe mit vordefiniertem Volumen.

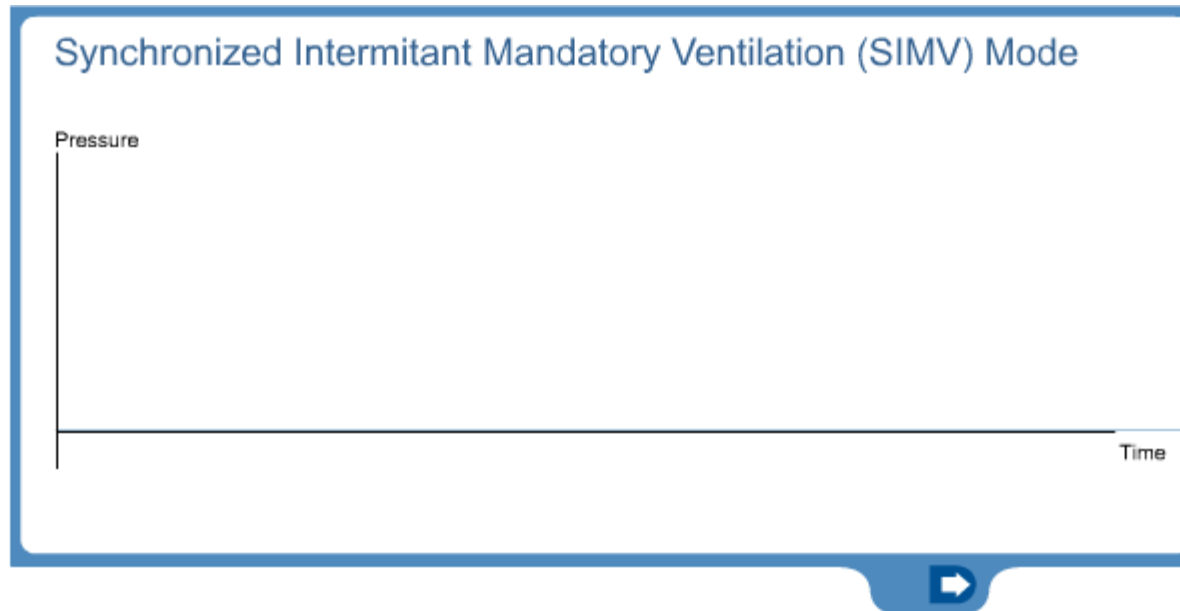


**In Control Ventilation (CV) mode, volume controlled machine breaths are given at the rate specified by the Breath Rate setting and no triggered breaths are allowed.**



# Synchronisierte Intermittierende Mandatorische Beatmung (SIMV)

Spontane, assistierte und mandatorische Hübe mit einem vordefiniertem Tidalvolumen.

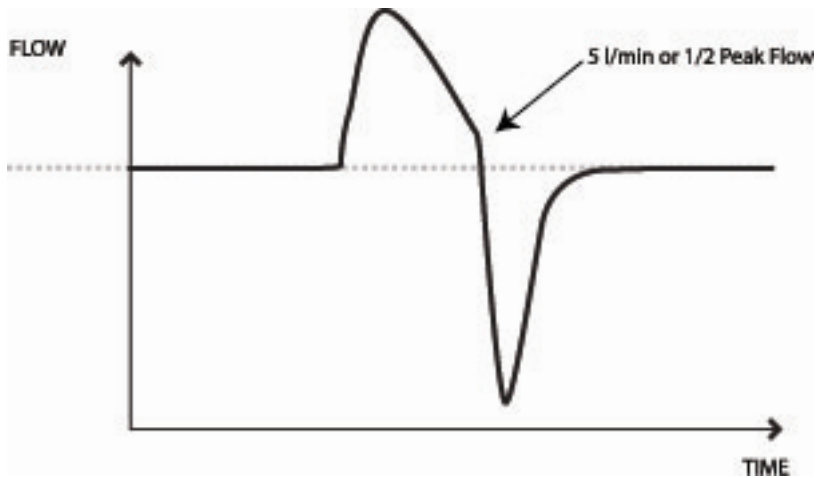


**In SIMV mode, breaths can be patient-triggered or ventilator-initiated. If the patient is not triggering breaths, the ventilator delivers Mandatory breaths at the designated volume set. If the patient triggers a breath, the ventilator delivers an Assist breath or a Spontaneous breath, based on when the breath is triggered.**

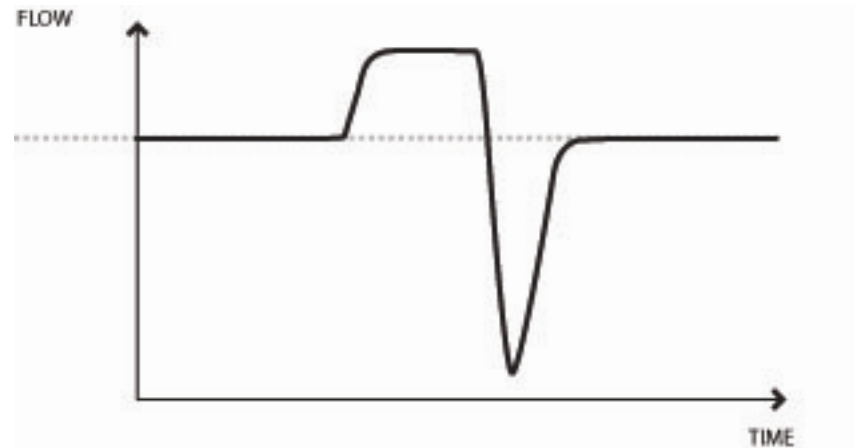


# Waveform Patterns

- Rampe



- Rechteck



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