



## Dräger Ventilation Mini Manual

Brief explanation of ventilation modes and functions



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## **PC-BIPAP vs. PC-AC**

Pressure Control – Biphasic Positive Airway  
Pressure vs. Pressure Control – Assist Control

### **PC-BIPAP**

#### **PC-AC (BIPAP ASSIST)**

- machine- or patient-triggered, mechanical strokes with inspiratory synchronisation
- spontaneous breathing possible at any time
- back-up frequency

With **PC-BIPAP** the patient can breathe spontaneously at any time, while the number of mandatory strokes is pre-set. In this mode, the mandatory strokes exhibit both an **inspiratory as well as expiratory synchronisation with the patient's breathing efforts**. If the mandatory stroke is reduced due to expiratory synchronisation, the subsequent mandatory stroke is extended. The inspiratory synchronisation shortens the expiration phase. In this case, the subsequent expiration time is extended by the missing time. This ensures that the set mandatory breathing frequency ( $f$ ) remains constant. Machine-triggered mechanical breaths are applied if no spontaneous breathing is detected during the inspiration trigger window. The patient may receive Pressure Support (PS) during spontaneous breathing at the PEEP level.



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Fig. 1 (PC-BIPAP with mandatory and spontaneous mechanical breaths)

With PC-AC, every attempt to breathe that is detected on the PEEP level triggers a mandatory mechanical breath. This means that the patient determines the time and the number of mandatory mechanical breaths. To give the patient enough time for expiration, it is not possible to trigger another mandatory breath directly after a mechanical breath. A mandatory breath is applied (backup frequency), if no mechanical breath has been triggered after the expiratory time has elapsed.



Fig. 2 (PC-AC with triggered and untriggered mechanical breaths)

## PC-APRV

(Pressure Control – Airway Pressure Release Ventilation)

- pressure-controlled
- time cycled
- machine-triggered
- spontaneous breathing under continuous positive breathing pressure with brief pressure relief times (screenshot)

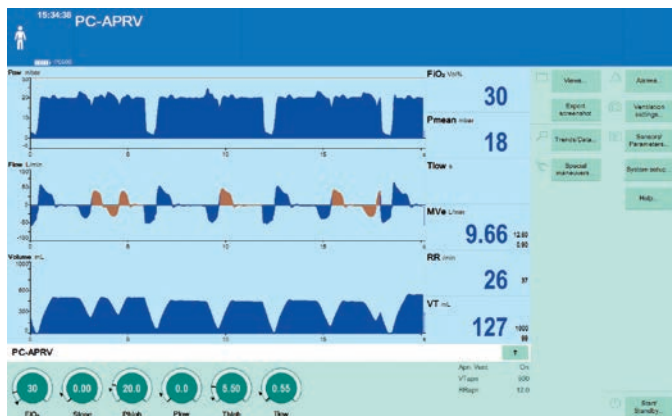
In PC-APRV, the patient's spontaneous breathing takes place at the upper pressure level  $P_{\text{high}}$ . This pressure level  $P_{\text{high}}$  is maintained for the duration of  $T_{\text{high}}$ . To achieve active expiration, the pressure is reduced for a brief period from  $T_{\text{low}}$  to  $P_{\text{low}}$ . To support  $\text{CO}_2$  elimination, the pressure is then reduced to  $P_{\text{low}}$  for the brief period  $T_{\text{low}}$ . The alternation between the two pressure levels is machine-triggered and time-cycled. The breathing volume (VT) that expired during the relief times, results from the pressure difference between  $P_{\text{low}}$  and  $P_{\text{high}}$  and the lung mechanics. If the resistance or compliance of the lungs changes during the ventilation treatment, the supplied tidal volume (VT) and thus the minute volume MV may also vary.

During the activation of AutoRelease, the duration of released pressure is determined by the expiratory flow trace. The Exp. term. setting determines the percentage by which the expiratory flow must fall short of in relation to the peak flow for the ventilation to return to the high pressure level.

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Fig. 1 (PC-APRV with AutoRelease on and measured  $T_{low}$  in seconds)

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Fig. 2 (PC-APRV with spontaneous breathing on  $P_{high}$  level)



## VC-MMV + AutoFlow

### Volume Control – Mandatory Minute Volume + AutoFlow

- volume-controlled ventilation to backup a mandatory minute volume
- the mechanical breaths are automatically and gradually reduced for patients with increasing spontaneous breathing, which is possible at any time
- enables automatic weaning by reducing the mechanical breathing frequency and
- necessary ventilation pressure

VC-MMV behaves in a similar manner to VC-SIMV; however, the mandatory breaths are only administered if the spontaneous breathing is insufficient and falls below a set minute volume. If the spontaneous breathing increases, fewer mandatory breaths are administered. This allows VC-MMV to ensure that the patient always at least receives the set minimum volume MV ( $MV=VT*f$ ). The applied mechanically triggered, timed breaths are synchronised with the patient's inspiratory efforts. This ensures that spontaneous breathing is always possible for the patient at the PEEP level. If the patient's spontaneous breathing is sufficient to achieve the set MV, no further mandatory breaths are applied. This means that the set breathing frequency (f) is the maximum number of mandatory breaths. The patient may receive Pressure Support (PS) during spontaneous breathing at the PEEP level. Every inspiratory effort by the patient at the PEEP level, which meets the trigger criteria, triggers a pressure-supported mechanical breath. The time, number and duration of the pressure-supported mechanical breaths are determined by the patient's spontaneous breathing.

AutoFlow (AF) ensures that the set tidal volume (VT) is applied with the minimum necessary pressure for all volume-controlled, mandatory breaths. In the event of changing resistance (R) or compliance (C), the pressure is gradually adjusted in order to administer the set VT. Both the pressure and the flow are adapted automatically. The patient is able to breath spontaneously during the entire breathing cycle, during inspiration and expiration.

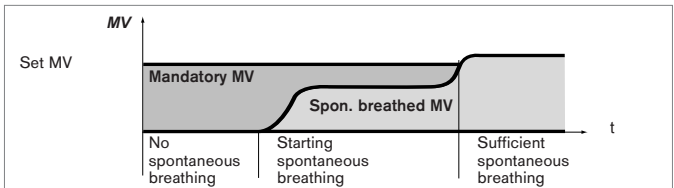


Fig. 1 (from 100% ventilation to 100% spontaneous breathing)



Fig. 2 (VC-MMV + AF with mandatory breath and spontaneous breathing)

## ATC

### Automatic Tube Compensation

- ensures that the set airway pressure is also obtained in the trachea
- is calculated and displayed based on a mathematical tube model, the set tube type and the tube's internal diameter (tracheal pressure)
- can be activated for any mode of ventilation

The tube as an artificial resistance in the airway is the main reason for increased breathing effort by the patient. The automatic tube compensation is a supplement for all ventilation modes and enables the precise compensation of this increased work of breathing, with easy setting options. The patient's inspiratory effort should feel as if they are not intubated. A gas flow through the tube leads to a pressure difference ( $\Delta P$  tube) between the start and end of the tube [Fig. 1]. This pressure difference should stimulate the respiratory muscles in the form of increased negative pressure in the lungs. However, the increased work of breathing can be compensated by increasing the pressure in front of the tube by precisely the amount of the pressure difference. This means that the pressure in front of the tube also needs to be continuously adapted to the relevant gas flow. The actual pressure difference is calculated based on the gas flow measured by the ventilator. Automatic tube compensation can be activated for any mode of ventilation. The tube dimensions must first be set. The level of compensation (generally 100%) can be used to fine-tune the settings for the relevant tube in order to prevent overcompensation. The length of the tube does not have a significant influence on the tube resistances, even for very short tubes, and is not set.

The tube compensation is applied for both inspiration as well as expiration. [see Fig. 3] If necessary for expiratory compensation, the pressure in the tube system is reduced to no less than the ambient pressure in order to facilitate the patient's exhalation. The control ensures that the tracheal pressure does not fall below the set CPAP pressure.

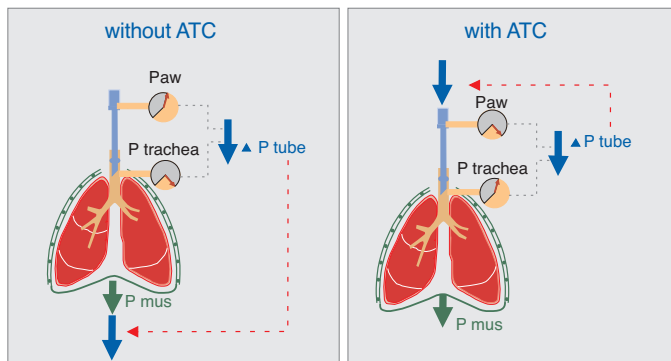


Fig. 1 Without ATC, the patient needs to apply the  $\Delta P_{tube}$ .

With ATC, the ventilator generates precisely this  $\Delta P_{tube}$  and provides relief for the patient.

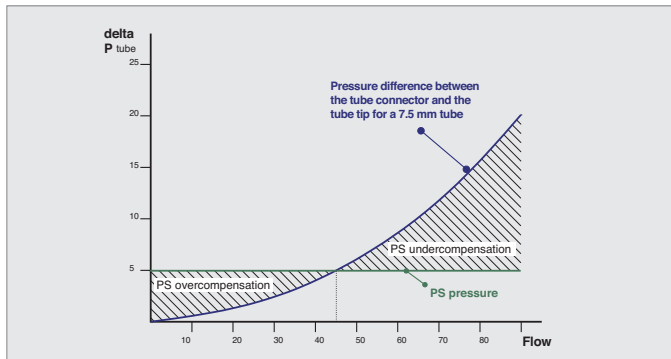


Fig. 2 Set pressure support (PS) compared to pressure support required in principle (blue line) for tube compensation.

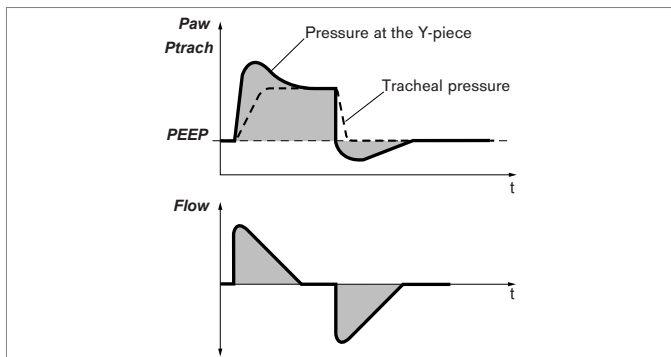


Fig. 3 Pressure profile for tube compensation during inspiration and expiration.

## SPN-PPS

### Spontaneous – Proportional Pressure Support

- applies patient-triggered pressure support in proportion to the patient's inspiratory effort
- the level of support can be set separately for restrictive or obstructive work of breathing

For SPN-PPS, the pressure support should ideally be proportional to the patient's inspiratory effort. If the patient's breathing is shallow, little support is provided. More support is applied for a deep breath. The absolute amount of support depends on both the Flow Assist and Volume Assist parameter settings as well as the patient. The two types of pressure support, pressure support proportional to volume (Volume Assist) and pressure support proportional to flow (Flow Assist) [Fig. 1] can be combined. If set correctly, only the illness-related higher work of breathing is continuously adapted and compensated – the physiological work of breathing continues to be provided by the patient alone. Flow Assist helps overcome the resistance ( $R$ ) and the pressure support is proportional to the flow. In contrast, Volume Assist compensates the elastic resistance ( $C$ ) caused by reduced elasticity of the lungs. The pressure support is proportional to the tidal volume. The relationship between the inspiratory effort and the pressure support remains constant for the same settings, while the pressure support varies for every breath. If no spontaneous breathing is detected, the mechanical support also ceases. Adequate apnoea and minute volume monitoring must therefore be in place.

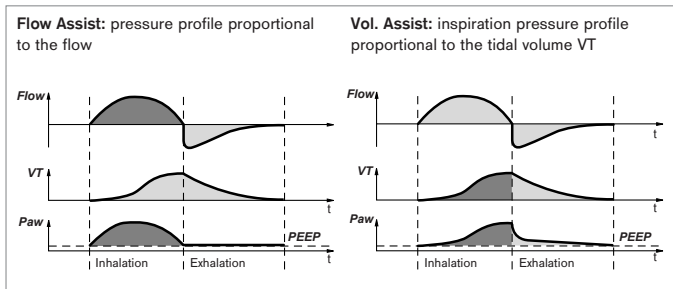


Fig. 1 Rules for Flow and Volume Assist



Fig. 2 SPN-PPS, typical pressure and flow graph

## SmartCare®

- is an automatic clinical protocol
- reduces the pressure support based on the averaged measured values for the spontaneous respiratory rate, the tidal volume and the  $\text{ETCO}_2$  until the lowest possible level is reached
- can reduce the overall ventilation period by up to 33% and the stay in the intensive care unit by up to 20%<sup>1)</sup>

SmartCare®/PS is an automated clinical protocol, which was designed to stabilise a patient's spontaneous breathing in a "comfort zone" and automatically reduce the respiratory support. The patient should be ready for weaning, i.e. haemodynamically stable, and display adequate oxygenation and spontaneous breathing. SmartCare/PS attempts to keep the patient within the "normal ventilation" range and places the patient back "on the right track" in the event of a contrasting diagnosis. The patient's ventilation status is classified into eight different diagnoses and defined measures are taken in order to bring the patient back to the "normal ventilation" range, also referred to as the "respiratory comfort zone". The three key criteria are the spontaneous respiratory rate (RR<sub>spont</sub>), tidal volume (VT) and endtidal CO<sub>2</sub> (ETCO<sub>2</sub>) [ventilator's measured values]. This protocol is active during all phases of a SmartCare/PS session. In addition, the pressure support level is gradually reduced during the "adapt" phase, while continuous checks confirm whether the patient is able to tolerate the new level. If this is the case, the pressure support is reduced further, if not, it is increased back to a level that is appropriate for the patient. The optimal case involves the gradual and direct reduction of the pressure support until the lowest level is reached.



- 1) Lellouche, F. et al.; a Multicenter Randomized Trial of Computer-driven Protocolized Weaning from Mechanical Ventilation. *Am J Respir Crit Care Med* Vol 174. pp 894 -900, 2006 – The results are based on a randomised study in several European hospitals with 144 patients who displayed a stable ventilation situation, a stable haemodynamic and neurological status and no ARDS prior to their initial weaning.

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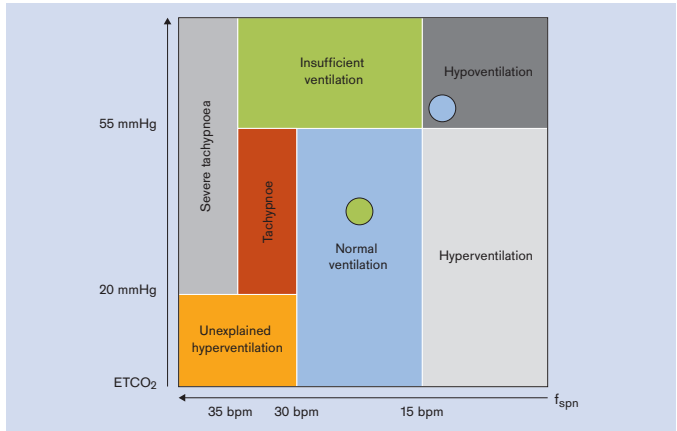


Fig. 1 Diagnostics diagram based on the key criteria

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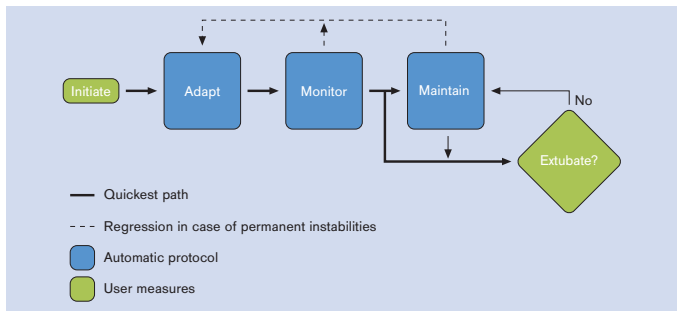


Fig. 2 Functional principle – individual phases during SmartCare®

## PREREQUISITES

It is important to choose the “right” patient. SmartCare/PS is ideal for patients with primary restrictive problems and longer expected weaning times. SmartCare/PS does not replace the clinician. The advantage of SmartCare/PS is its ability to continuously monitor the patient making appropriate changes to pressure support much more often than this would be possible manually. Prior to starting weaning with SmartCare/PS, the patient must be haemodynamically stable, be ventilated with SPNCPAP/PS (optionally with ATC), and the set PEEP must be  $\leq 20$  mbar.

## QUICK START

### 1. PATIENT

- a) Set the patient’s height; this calculates the IBW and the lower limit for the tidal volume ( $V_t$ ) can be derived from it.
- b) Set the maximum permissible PEEP value and the inspiratory oxygen concentration for the start of the spontaneous breathing test.



**!** *SmartCare/PS can be started with any PEEP setting between 0 and 20 mbar and with any selected  $FiO_2$  concentration. The spontaneous breathing test starts once the target support pressure ( $\Delta P_{supp}$  target, see 2.) has been reached and the PEEP and  $FiO_2$  values set by the user have been reached or undercut.*

## 2. ACCESS TO THE AIRWAY

These settings define the target support pressure at which the spontaneous breathing test starts (provided that PEEP and  $\text{FiO}_2$  are also below the set values – see 1). The following table shows the dependencies of the different settings:



Access to the airway, type of humidification	$\Delta\text{P}_{\text{supp}}$ target	IBW
Patient tracheostomised, active/no humidification, ATC OFF	5 mbar	$\geq 36$ kg
Patient endotracheally intubated, active/no humidification, ATC OFF	7 mbar	$\geq 36$ kg
Patient tracheostomised, HME filter, ATC OFF	9 mbar	$\geq 36$ kg
Patient endotracheally intubated, HME filter, ATC OFF	10 mbar	$\geq 36$ kg
Patient tracheostomised or endotracheally intubated, active humidification, ATC ON	0 mbar	$\geq 36$ kg
Patient tracheostomised or endotracheally intubated, HME filter, ATC ON	5 mbar	$\geq 36$ kg

**!** *If the therapists prefers to set target values for the pressure support that differ from those that are shown in the table, he can enter “wrong” specifications (e.g., tracheostomised rather than intubated) to generate a different target value for the pressure support.*

### 3. MEDICAL HISTORY

Selection of COPD and neurological disorder for the automatic adaptation of the upper limit for  $\text{etCO}_2$  and the respiratory rate (RR)



! The COPD “Yes” setting means that the SmartCare/PS continues to accept  $\text{etCO}_2$  values less than or equal to 64 mmHg (8.5Kpa) as normal. This may also be helpful for patients with permissive hypercapnia. The neurological disorder “Yes” setting means that the SmartCare/PS continues to accept respiratory rates of up to 34/min as normal. This may also be helpful for patients with higher respiratory drive.

### 4. NIGHT'S REST

No active weaning takes place during the selected period, i.e., SmartCare/PS maintains the pressure support it had reached prior to night rest commencing. However, SmartCare/PS will increase the pressure support if the patients condition deteriorates.



💡 Night's rest can also be set in order to give the patient a break from weaning. It is also possible to set or switch off night's rest during an ongoing session.

## 5. CHANGE THE GUIDELINE

Extended functionality for customising the weaning protocol.




! This lets you define an individual respiratory comfort zone for the patient. The set values of the medical history (see 3.) have no impact if the guideline is changed.

## 6. START PATIENT SESSION

Flow measurement, CO<sub>2</sub> measurement and apnoea ventilation must be switched on.



! The following icon appears in the header bar once the SmartCare/PS session has successfully started 

## TIPS AND TRICKS

- Alarm limits must generally be set above and below the SmartCare/PS limit values (see instructions for use).
- An apnoea alarm leads to the unwanted cancellation of the SmartCare/PS session.  
Therefore, possible disconnections should be shorter than the set apnoea time.
- A functioning CO<sub>2</sub> measurement is required for SmartCare/PS (position the CO<sub>2</sub> cuvette to prevent the accumulation of moisture or secretion, e.g., between the Y-piece and the HME filter or vertically, pointing upward).
- Configure a specific SmartCare/PS view with the required specific information (SmartCare/PS values, status and trends).
- Use the O<sub>2</sub>/suction function to perform a suction manoeuvre. This pauses the SmartCare/PS and gives the patient time to recover.
- The SmartCare/PS is suitable for adult and paediatric patients.

**More information: [www.draeger.com/smartcare](http://www.draeger.com/smartcare)**

## P0.1 – Occlusion Pressure Measurement

- occlusion pressure measurement at the start of inspiration
- is a measure of the neuromuscular respiratory drive<sup>1)</sup>

During a P0.1 manoeuvre, the ventilator closes the inspiratory valve for a brief period after expiration and measures the airway pressure generated over 100 ms by the inspiratory effort [Fig. 1]. The pressure is not influenced by physiological compensation reactions, e.g. reflective respiratory arrest or increased drive, within 100 ms. This pressure also fundamentally depends on the muscular strength of the diaphragm. As a result, the negative mouth pressure P0.1 after 0.1 seconds is a measure of the neuromuscular respiratory drive<sup>1)</sup>. The ventilator displays the value of the measured pressure difference [Fig. 2]. For patients with healthy lungs and calm breathing, the P.01 value is between 3 and 4 mbar (3 to 4 cmH<sub>2</sub>O). A higher P0.1 value reflects a high respiratory drive, which can only be maintained for a limited time. P0.1 values over 6 mbar (6 cmH<sub>2</sub>O), e.g. for a COPD patient, reflect imminent fatigue (respiratory muscle fatigue). As shown in figure 1, the 100 ms starts once negative pressure of -0.5 mbar (-0.5 cmH<sub>2</sub>O) is measured during the inspiratory effort under PEEP/CPAP. The second pressure value is determined after the 100 ms have elapsed. The inspiratory valve is simultaneously opened. The patient can then breathe normally once again. The pressure difference value “P2 - P1” defines the occlusion pressure P0.1.

Normal value<sup>1)</sup>:

$P0.1 = 1$  up to  $4$  mbar

$P0.1 > 6$  mbar, indication of imminent respiratory muscle fatigue,  
high probability of weaning failure.

1) Oczenski W (ed). Atmen-Atemhilfen. 8. Auflage 2008

Tobin MJ (ed). Principles and Practice of Mechanical ventilation. Second Edition. McGraw-Hill, New York, 2006, Sasson CSH, et al. Airway Occlusion Pressure : An important Indicator for successful weaning in patients with Chronic obstructive pulmonary disease. AM Respir Dis. 1987;135:107-113

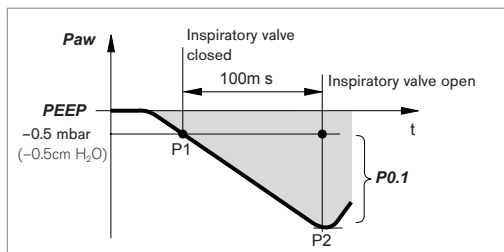


Fig. 1 Functional principle of the P0.1 measurement

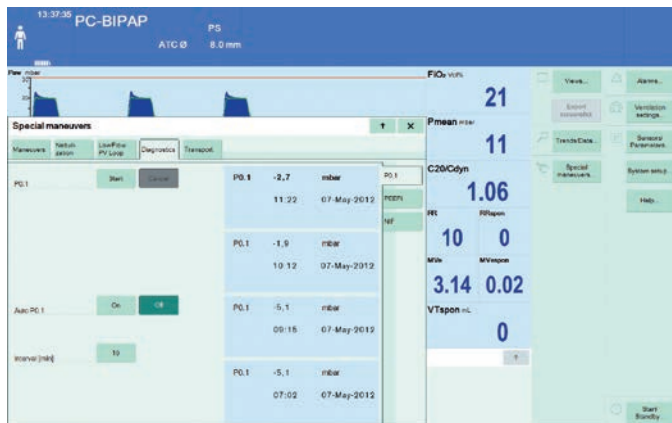


Fig. 2 Screen layout during a P0.1 measurement



## Leak Compensation

- leaks are compensated for in volume- and pressure-controlled ventilation
- the inspiratory flow trigger threshold and the cancellation criteria for pressure support are adapted automatically
- leak compensation displays all the volume and flow measured values with leak compensation

The ventilator determines the difference between the dosed inspiratory flow and the flow measured during expiration. This difference defines the size of the leak and is displayed as the leak minute volume  $MV_{leak}$  and the relative leak % ( $MV_{leak}$  to  $MV$ ). The leak correction calculation takes the pressures in the breathing circuit into account. The percentage volume loss during inspiration is greater than the loss during expiration, as the pressure is higher during inspiration. The leak minute volume  $MV_{leak}$  also considers inspiratory leaks. During volume-controlled ventilation, the ventilator provides additional volume to compensate for the leak. The ventilator compensates volume losses up to 100% of the set tidal volume  $V_t$ . Measured volume and flow values are displayed with leak compensation. An exception is the measured expiratory minute volume as well as measured values marked as inspiratory or expiratory, such as  $VT_i$  and  $VT_e$ . The inspiratory flow trigger threshold and the cancellation criterion are applied to the leak-corrected flow, while both settings are continuously adapted with respect to the leak.

Vt	Tidal volume, leak-corrected
Vti	Inspiratory tidal volume, without leak-correction
Vte	Expiratory tidal volume, without leak-correction
Mv	Minute volume
Mvi	Inspiratory Minute volume, without leak-corrected
Mve	Expiratory Minute volume, total, without leak-corrected
Mvleak	Leak Minute volume (based on the medium pressure Paverage)



Fig. 1 Screen example with VC-AC, large leak without leak compensation



Fig. 2 Screen example with VC-AC, large leak with leak compensation

## NIV

### Non-invasive ventilation

- in all ventilation modes
- with comprehensive monitoring
- with alarm adaptation
- with automatic leak compensation

When ventilating adults or children, non-invasive ventilation may help to avoid intubation.<sup>1)</sup> In other cases, it supports the weaning process for intubated patients. The additional availability of mask ventilation in the weaning phase helps to improve workflows and can potentially reduce the risk of intubation.<sup>1)</sup>

Irrelevant alarms, which are necessary during invasive ventilation, can be suppressed during non-invasive ventilation. As a result, alarm settings that are not required can be disabled. (E.g. MV low, V<sub>ti</sub> high and apnoea monitoring).

Leak compensation is an important feature for non-invasive ventilation. When leak compensation is activated, the patient always receives the set V<sub>t</sub> volume (i.e. leaks are taken into account for the tidal volume). The flow trigger and the cancellation criteria are continuously adapted with respect to the leaks. In addition, the set pressure is maintained if leaks occur.

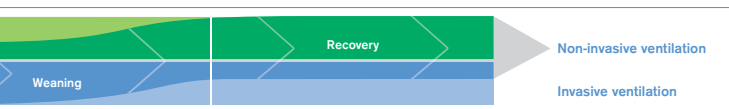


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Fig. 1 Ventilation path

If the mask is removed, the Anti-Air Shower function (available with Evita XL and Evita Infinity V500) detects this interruption and reduces the gas flow provided by the ventilator to a minimum. This minimises the risk of the possible contamination of the nursing staff and the ambient air.

1) Ferrer M; am J respir crit care Med vol 168, pp 1438–1444, 2003



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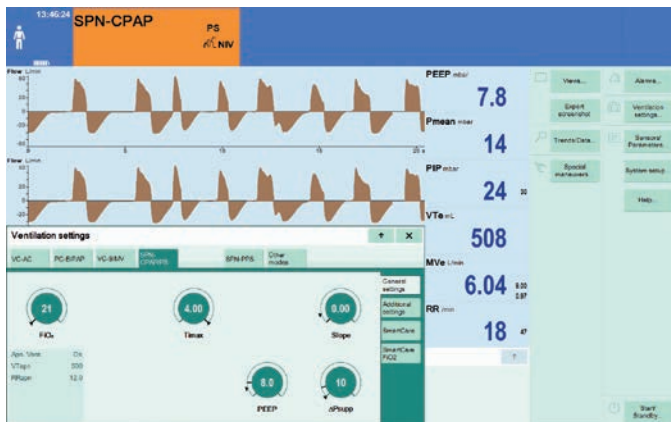


Fig. 2 Example of a SPN/CPAP/PS setting window for activated NIV

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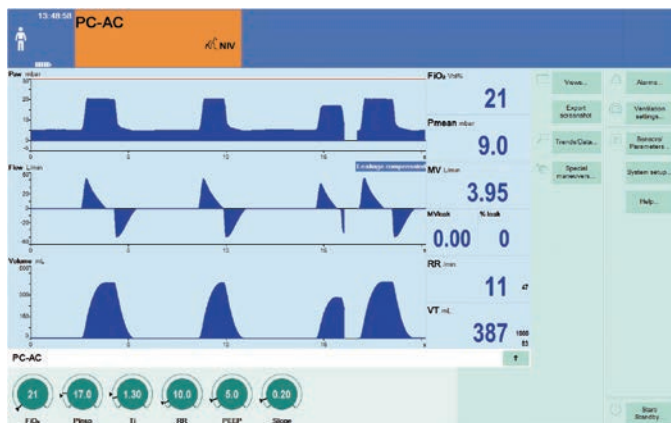


Fig. 3 Example PC-AC screen for activated NIV

## Variable PS

### Variable Pressure Support

(noisy ventilation/variable pressure support)

- is an automatic variation of the pressure support (PS) in SPN-CPAP/PS
- randomly changes the supporting pressure within a defined variation range
- supports the physiological variance of spontaneous breathing

The “variable pressure support” generates random pressure support variations. This changes the tidal volume regardless of the patient's spontaneous breathing efforts, as different pressure support levels are applied for each breath. The basic principle for pressure-supported spontaneous breathing remains in place and is not modified.

A specific pressure support ( $\Delta P_{\text{supp}}$ ) is initially set. The amount of variation is defined as a percentage of the set pressure support (PS) and can vary from 0% to 100%. For example, a set pressure support of 10 mbar and a variance of 50% provides for a minimum pressure support of 5 mbar and a maximum pressure support of 15 mbar. Due to the variation of the pressure support, different ventilation pressures and tidal volumes are provided for every breath. The maximum pressure support, which can be achieved by the variation, is limited by the maximum airway pressure ( $P_{\text{max}}$ ) setting. The lower variation threshold is defined by the set CPAP level.

The ventilation pressure amount is independent of the patient's inspiratory effort.

The pressure support variation provided by variable PS leads to an increased variability of the tidal volume (VT) compared to conventional pressure-supported ventilation, regardless of the patient's inspiratory effort. In addition, variable PS can improve oxygenation and result in the redistribution of the pulmonary blood flow.<sup>1)</sup>

1) M. Gama de Abreu et al Noisy pressure support ventilation: A pilot study on a new assisted ventilation mode in experimental lung injury. Crit Care Med 2008 vol. 36, no.3



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Fig. 1 Screen for SPN-CPAP/PS with variable pressure support

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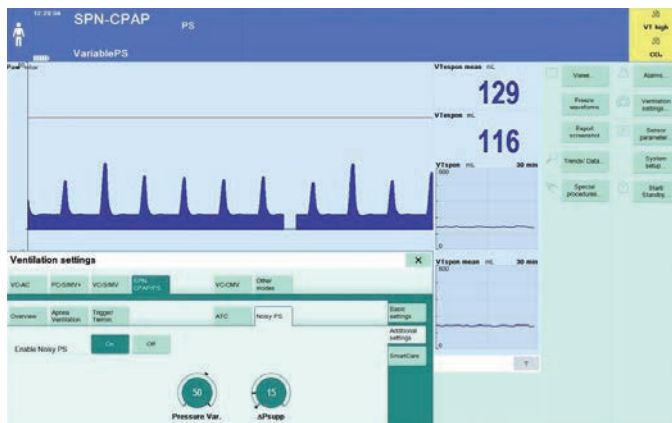


Fig. 2 Setting window for the variable pressure support

## PEEPi

### Intrinsic PEEP (intrinsic PEEP / AutoPEEP)

- is the actual end-expiratory pressure in the lungs
- is added to the PEEP set on the ventilator

There may be various reasons to explain why the total inhaled volume cannot subsequently be exhaled. The unphysiological volume retained in the lungs leads to an intrinsic PEEP. Overly short expiratory times, obstructions, or slow lung compartments are likely to be the main reason for this.

The measuring manoeuvre determines the volume that remains in the lungs ( $V_{\text{trap}}$ ). The intrinsic PEEP measurement is performed in two measurement phases. The ventilator keeps the inspiratory and the expiratory valve closed for the duration of measurement phase 1. This means that neither inhaled gas can enter the breathing circuit, nor other gas can leave the breathing circuit. A pressure equalisation between the lungs and the ventilation system takes place during this measurement phase. The ventilator measures this pressure profile. The patient's breathing activity during the manoeuvre may distort the measured values. Measurement phase 1 comes to an end:

- when the pressure profile does not show any further changes.  
The starting value is equal to the PEEP and the value at the end of the measurement phase is the intrinsic PEEP.

At the end of measurement phase 1, the ventilator opens the expiratory valve and measures the expiratory flow that is generated by the intrinsic PEEP in measurement phase 2. The lungs are relieved to the PEEP.

Measurement phase 2 comes to an end:

- when the expiratory flow has returned to 0. The measured flow corresponds to the volume trapped in the lungs due to the intrinsic PEEP ( $V_{trap}$ ).

Effective PEEP ( $PEEP_{total}$ ) = PEEP ( $PEEP_{set}$ ) + intrinsic PEEP

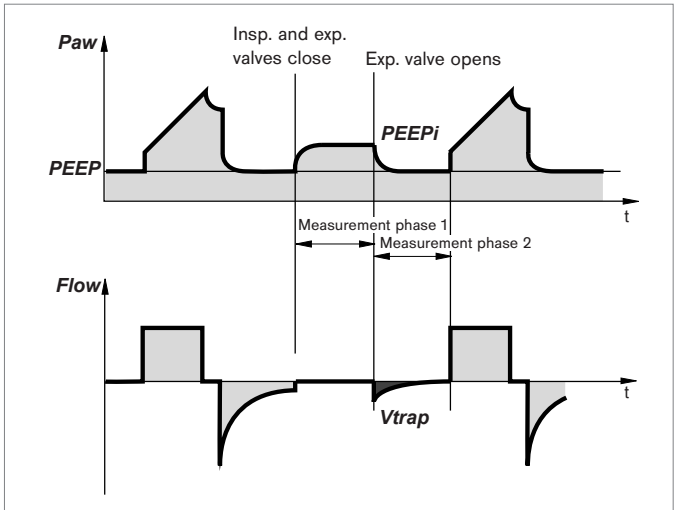


Fig. 1 Functional principle of the intrinsic PEEP measurement



Fig. 2 Screen example of the intrinsic PEEP measurement

## Low Flow Manoeuvre

- may record a virtually static inspiratory and expiratory PV loop
- may provide information for the PEEP and P<sub>insp</sub> setting

Slowly filling the lungs with a low, constant flow (generally 4 to 10 L/min<sup>1)</sup>) determines the elastic properties of the PV loop. This virtually static process displays a good correlation with the static Super Syringe method, provided that the flow is low. The loop can only be recorded for inspiration or for inspiration and expiration. Two cursors can be moved over the PV loop in order to determine the lower inflection point (LIP) or the upper inflection point (UIP) on the inspiratory limb and the critical connection pressure (CCP) or the point of maximum curvature (PMC) on the expiratory limb. This can also be used to calculate the static compliance.

The user can define the gas flow, the maximum applied pressure and the maximum applied volume for the manoeuvre. The user can also set a starting pressure, which should normally be well below the set PEEP.

Valid data is only provided if the patient is not breathing spontaneously.

1) Blanc Q, sab JM, Philit F, Langevin B, Thouret JM, Noel P, Robert D, Guérin c. Inspiratory pressure-volume curves obtained using automated low constant flow inflation and automated occlusion methods in arDS patients with a new device. *Intensive Care Med.* 2002 Jul;28(7):990-4. epub 2002 Jun 12.

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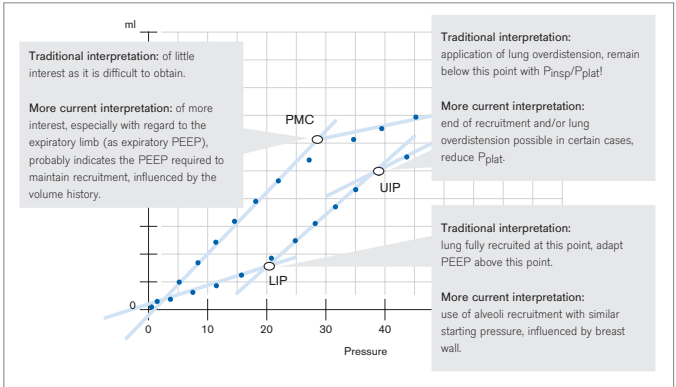


Fig. 1 Information from the Low Flow manoeuvre

D-9096-2009



Fig. 2 Example evaluation menu screen following Low Flow measurement

## Ventilation in intensive care for adults

### Volume-controlled ventilation modes

Previous nomenclature	IPPV/ CMV	IPPV <sub>assist</sub> / CMV <sub>assist</sub>	SIMV	MMV
New nomenclature	VC-CMV	VC-AC	VC-SIMV	VC-MMV

### Pressure-controlled ventilation modes

Previous nomenclature		BIPAP <sub>assist</sub> / PCV <sub>assist</sub> <sup>+</sup>		BIPAP/ PCV <sup>+</sup>	APRV	
New nomenclature	PC-CMV	PC-AC	PC-SIMV	PC-BIPAP	PC-APRV	PC-PSV

### Supported spontaneous breathing modes

Previous nomenclature	CPAP/ASB/ CPAP/PS			PPS
New nomenclature	SPN-CPAP/PS		SPN-CPAP/VS	SPN-PPS

## Ventilation in intensive care for neonates

### Pressure-controlled ventilation modes

Previous nomenclature	IPPV	SIPPV	SIMV	PSV	CPAP-HF		
New nomenclature	PC-CMV	PC-AC	PC-SIMV	PC-APRV	PC-PSV	PC-HFO	PC-MMV

### Supported spontaneous breathing modes

Previous nomenclature					CPAP
New nomenclature	SPN-CPAP/PS	SPN-CPAP/VS		SPN-PPS	SPN-CPAP

## Ventilation in anaesthesia

### Volume-controlled ventilation modes

Previous nomenclature	IPPV	SIMV
New nomenclature	Volume Control - CMV	Volume Control - SIMV

### Pressure-controlled ventilation modes

Previous nomenclature	PCV	
New nomenclature	Pressure Control - CMV	Pressure Control - BIPAP

### Pressure-controlled ventilation modes

Previous nomenclature		Man. Spont.
New nomenclature	Pressure Support - CPAP	Man./Spon

More information (e.g. product training material, booklets and case studies) is available at [www.draeger.com](http://www.draeger.com) under the Training heading in the Hospital area.











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