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MEDUMAT Transport

Step-by-step instructions

- Ventilation initiation by height
- NIV therapy
- Ventilation modes at a glance

Attention:
This document does not replace the instructions for use. Complete information can be found in the instructions for use.

Ventilation from the emergency site to the hospital

Take advantage of the versatility of the MEDUMAT Transport. The ventilator allows for unprecedented usability: from the emergency medical team in a pre-hospital setting to the secondary transport of emergency and intensive care patients. For fast readiness for use and correct handling of the MEDUMAT Transport, we are providing you with a brief overview of NIV therapy, ventilation initiation by height, and the ventilation modes.

All of our experience at your service:

- Experience since 1874
- Success in more than 100 countries
- Made in Germany
- Family-owned company
- Market leader:
over 75,000 MEDUMAT devices in use

We Simplify Saving Lives


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Ventilation start-up based on height

Start up quickly and ventilate accurately

From now on, you will no longer need to spend time considering which tidal volume (Vt) and which respiratory rate (Freq) are best suited to your patient. With MEDUMAT Transport, you can now initiate ventilation even more precisely and even faster. By inputting the patient's height and gender, your ventilator automatically calculates all the ventilation parameters for the ideal body weight (IBW). IBW is an important indicator for setting ventilation parameters[i]. MEDUMAT Transport allows you to initiate ventilation faster and far more precisely. This gives you more time for all other important tasks.

⚠ WARNING

Risk of injury resulting from incorrectly set restriction of maximum airway pressure! An excessively high airway pressure might cause the patient serious or life-threatening injury.

⇒ Always set the pressure limit pMax to suit the current patient and the current therapy.

Use presets and work according to guidelines

You can enter the patient's height in the Start menu, under the menu item "New patient" (only if the entry "Allow patient height entry" is activated in the operator menu). This section explains how the ventilator automatically calculates the ideal tidal volume using height and gender.

The ideal body weight (IBW) is calculated from the stated height in cm (X), as shown below:

• Child[1] (height < 154 cm):

$$\text{IBW child} = 2.05\ \text{kg} \bullet \exp\left(\frac{x}{50\ \text{cm}}\right)$$

• Adult[2] (height > 154 cm):

$$\text{IBW (female)} = 45\ \text{kg} + 2.3\ \text{kg} \bullet \left(\frac{x}{2.54\ \text{cm}} - 60\right)$$

$$\text{IBW (male)} = 50\ \text{kg} + 2.3\ \text{kg} \bullet \left(\frac{x}{2.54\ \text{cm}} - 60\right)$$

The tidal volume for the patient is calculated with the aid of the ideal body weight and the setting Vt per body weight (Vt/BW) in the operator menu:

$$Vt = \text{IBW} \bullet \frac{Vt}{\text{Body weight}}$$

Example

• Patient, male, height 185 cm

• Setting for Vt/body weight = 6 ml/kg

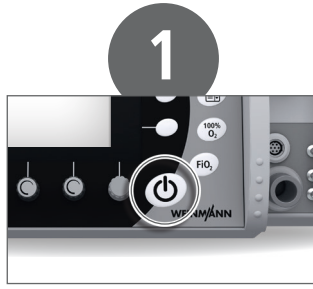
$$\text{IBW (male)} = 50\ \text{kg} + 2.3\ \text{kg} \bullet \left(\frac{185\ \text{cm}}{2.54\ \text{cm}} - 60\right) = 79.52\ \text{kg}$$

$$Vt = 79.52\ \text{kg} \bullet 6\ \frac{\text{ml}}{\text{kg}} = 477\ \text{ml} \approx 480\ \text{ml}$$

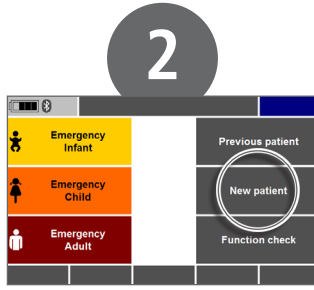
[1] Source: TRAUB, S.L.; JOHNSON, C.E.: Comparison of methods of estimating creatinine clearance in children. In: American journal of hospital pharmacy 37, 1980, No.2, pp. 195–201.

[2] Source: DEVINE, Ben J. Gentamicin therapy. The Annals of Pharmacotherapy, 1974, Volume 8, No. 11, pp. 650-655

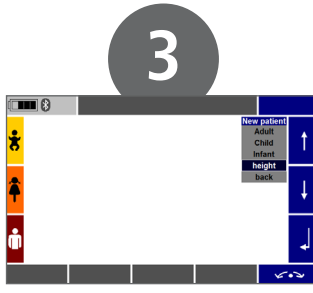
Operating steps



Switch on ventilator

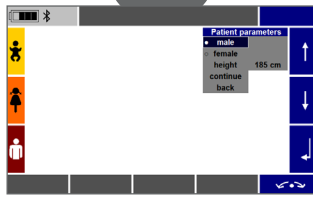


Select “New patient”



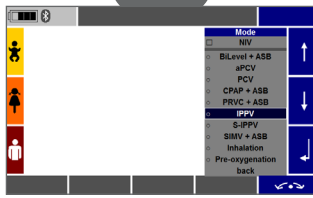
Select "height"

4



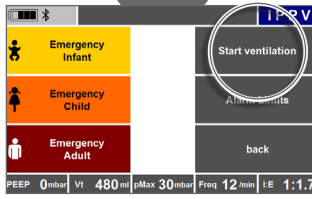
Select gender and patient height

5



Select ventilation mode

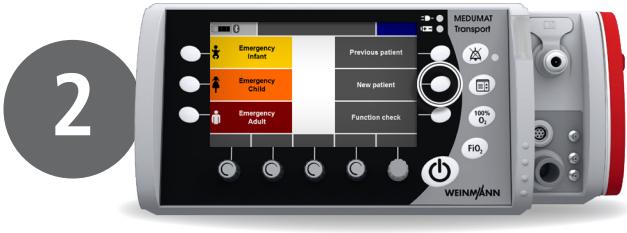
6



Start ventilation

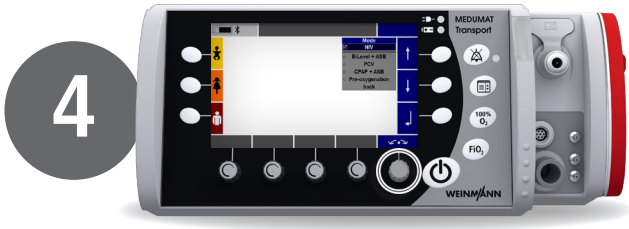
NIV therapy

Start MEDUMAT Transport using the On/Standby/Off button.

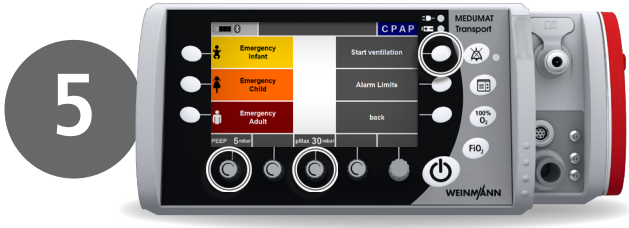


Select “New patient” in the Start menu.

Select the appropriate patient group: Adult, Child or Infant. Alternatively, select the option "Height" (only if the entry "Allow patient height entry" is activated in the operator menu). Then set the patient’s height and gender in the device.



Subsequently activate non-invasive ventilation (“NIV”). For the ventilation mode decide between: BiLevel + ASB, CPAP + ASB and CPAP (CPAP is the ventilation form “CPAP + ASB” with an ΔpASB of 0 mbar).



Then set the values using the rotating switch: PEEP (CPAP, CPAP + ASB and BiLevel + ASB), pInsp (only BiLevel + ASB), pMax (CPAP, CPAP + ASB and BiLevel + ASB), frequency (only BiLevel + ASB) or I:E (only BiLevel + ASB). After adjusting the corresponding values, begin the ventilation via “Start ventilation”.

Now connect the patient to MEDUMAT Transport. It is possible to adjust the values using the control knobs while the ventilation is running. You can control the inspiratory trigger and the pressure support (ASB) using the function keys on the right side. If it is necessary to change the ventilation mode, this is done using the “Mode” function button on the right side.

SOP

Non-invasive ventilation (NIV) for acute respiratory insufficiency (ARI)

Modified in accordance with the therapy recommendations for emergency medicine 2022 published by the Association of Emergency Physicians of Northern Germany (Arbeitsgemeinschaft in Norddeutschland tätiger Notärzte e.V. - AGNN).

Indications

- Hypoxemic ARI with respiratory rate > 25/min (count!) and SpO_2 < 90 % despite O_2 administration; e.g. cardiogenic pulmonary edema.
- Hypercapnic ARI = clinical ventilatory insufficiency with high respiratory rate/low TV; e.g. acute exacerbated COPD (aeCOPD), bronchial asthma.

Contraindications

- Absolute: No spontaneous breathing, gasping, blocked airways, gastrointestinal hemorrhage or ileus, non-hypercapnic coma.
- Relative: Hypercapnic coma, high-grade hypoxemia agitation, pronounced secretions, hemodynamic instability with shock, mask leakages.

Procedure

- Ensure logistical requirements: Check oxygen supply: at least a 2L bottle; filled. Check and adjust ventilator.
- Monitoring of respiratory rate (count!), SpO_2, ECG and $etCO_2$ as soon as NIV initiated.
- Commence NIV with patient semi-seated or seated.
- Slowly adjust the patient's face mask; if needed, the patient can initially hold the mask in place. The most important aim of the adaptation phase is the synchronization of the ventilator and the patient.
- If the patient is highly agitated, careful sedation may be helpful and necessary. A benzodiazepine, opiate or even Propofol in a sub-anesthetic dose are good options here.
- In the case of continuing leakage or patient apnea, the device switches to apnea ventilation (if activated). This mode can also be selected before connection to the patient.

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Adjusting the ventilation mode in the case of hypoxemic ARI

Mode: ..... CPAP (without pressure support)
Initial PEEP: ..... 5 mbar
Initial FiO_2: ..... 100 %
Target: ..... SpO_2 > 94 % (with COPD 88 – 92 %)

In the case of a more pronounced SpO_2 increase, reduce the FiO_2 accordingly

In the case of an insufficient SpO_2 rise, increase PEEP: ..... 7 – 10 mbar

In the case of insufficient tidal volume:
Pressure support: ..... 5 mbar (increase gradually if needed)
Inspiratory trigger: ..... as low as possible

Adjusting the ventilation mode in the case of hypercapnic ARI

Mode: ..... CPAP (with pressure support)
Initial PEEP: ..... 5 mbar
Initial pressure support: ..... 5 mbar
Inspiratory trigger: ..... As low as possible
Expiratory trigger: ..... As high as possible
Initial FiO_2: ..... 40 % or AirMix
Aim: ..... SpO_2 88 – 92 %

In the case of a more pronounced SpO_2 increase, reduce the FiO_2 accordingly, if needed

In the case of insufficient tidal volume:
Pressure support: ..... increase gradually (up to max. 20 mbar)
In the case of pronounced ventilatory insufficiency: ..... Change to BiLevel-ventilation if necessary

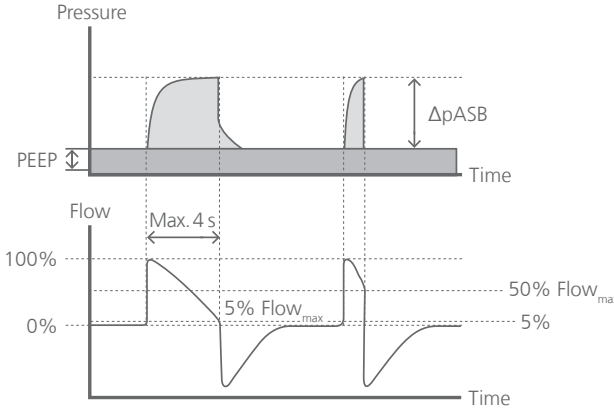
Success criteria

Decrease in dyspnea, respiratory and heart rate, increase in SpO_2, improved vigilance, reduced $etCO_2$ where applicable.

Caution

- Close clinical observation, stop if condition deteriorates
- Do not delay pharmacological/interventional therapy
- Be ready to intubate at all times when using NIV, especially in the case of relative contraindications
- Timely advance information to the receiving hospital

Pressure support and trigger



Pressure support ΔpASB

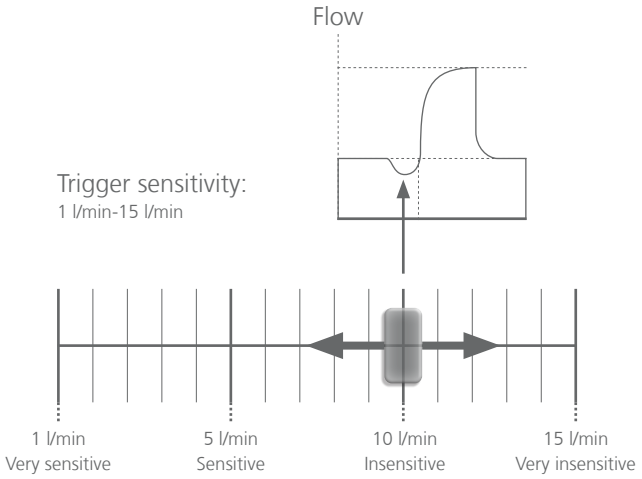
The pressure support is always given as a value above PEEP. In addition to the set PEEP, a patient receives this as soon as the inspiration trigger has been detected.

Example calculation:

PEEP = 5 mbar, ΔpASB = 10 mbar inspiration pressure in the inhalation phase = 15 mbar

Inspiratory and expiratory triggers

Ventilation can be individually adjusted to suit the patient with the aid of the inspiratory and expiratory triggers.

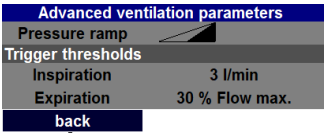


The inspiratory trigger triggers a pressure support or a mechanical breath as soon as inhalation effort is detected.
The expiratory trigger initiates the expiration, as soon as the flow to the patient equals the set value (in %) with respect to the maximum flow. The length of the pressure support is set with the expiratory trigger.

The setting options shown here depend on the ventilation mode selected.

Trigger thresholds

With this function you can set the inspiratory and expiratory trigger threshold and the trigger time slot.

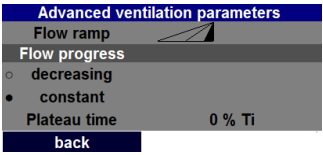


You can choose the following settings:

Parameter	Setting range
Inspiration	1 l/min to 15l/min
Expiration	5 % $Flow_{max}$ to 50 % $Flow_{max}$
Trigger time slot	0 % Te to 100 % Te

Flow progress

With this function you can set the flow progress.

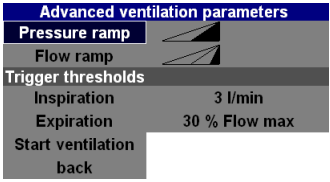


You can choose the following settings:

Parameter	Setting range
Flow progress	decreasing
	constant
	Plateau time (0 % T_i to 50 % T_i)

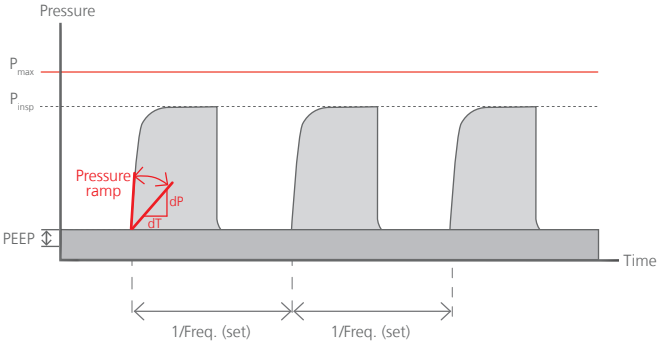
Pressure ramp (pressure increase time)

A pressure ramp (i.e. the pressure increase time) defines the time during which the pressure increases from PEEP to the inspiration pressure. This pressure increase time can be set according to the ramp format: flat, medium and steep.



Parameter	Setting range
Flat ramp	slow pressure rise
Medium ramp	medium pressure rise
Steep ramp	fast pressure rise

Pressure ramps using the example of a PCV curve

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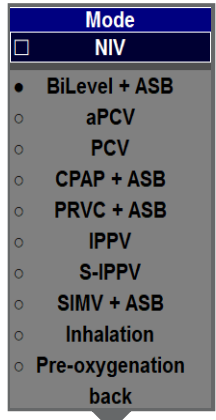

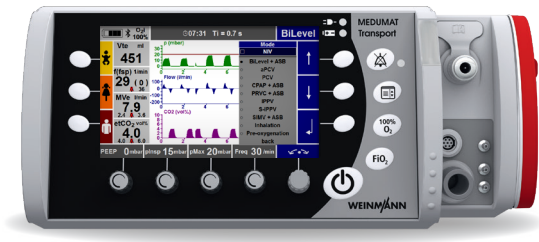

Ventilation modes at a glance

Many different names, many different ventilation modes. Almost every ventilator manufacturer today chooses its own names for the ventilation modes available on the respective device. This can lead to particular challenges, for example, during the transport and transfer of a patient receiving home ventilation.
In order to facilitate the future transfer of settings from one ventilator to another, we offer you in the following an overview of the meaning of our abbreviations.

Overview 1/2
Ventilation modes

	MEDUMAT Transport
Pressure-controlled ventilation modes	PCV
	aPCV
	BiLevel + ASB (invasive or non-invasive)
	PRVC + ASB
Volume-controlled ventilation modes	IPPV
	S-IPPV
	SIMV + ASB
Spontaneous ventilation modes	CPAP with ΔpASB=0
	CPAP + ASB (invasive or non-invasive)

We take no responsibility for the accuracy of the information. The information in the table below does not represent a 1:1 translation, but is merely an indication of the approximate equivalents.

	General description
	Pressure-controlled, mandatory ventilation
	Assisted, pressure-controlled ventilation
	Assisted, pressure-controlled ventilation with free spontaneous breathing at 2 pressure levels, with optional pressure support at the lower pressure level
	Assisted combination of pressure-controlled and volume-controlled ventilation, with optional pressure support at the lower pressure level and inspiration pressure regulation
	Volume-controlled, mandatory ventilation
	Assisted, volume-controlled ventilation
	Assisted, volume-controlled ventilation with optional pressure support at the lower pressure level
	Continuous positive airway pressure without pressure support
	Continuous positive airway pressure with pressure support)

Overview 2/2
Setting parameters

	MEDUMAT Transport
Setting parameter	pMax
	Freq.
	Vt
	pInsp
	PEEP
	ASB
	I:E
	Trigger inspiration (l/min)
	Trigger expiration (% of maximum inspiratory flow)
	Trigger time slot (time in % of expiratory time)
	constant, decreasing
	Pressure ramp/flow ramp (3 levels)

We take no responsibility for the accuracy of the information. The information in the table below does not represent a 1:1 translation, but is merely an indication of the approximate equivalents.

	General description
	Pressure limit
	Frequency
	Tidal volume
	Inspiration pressure
	Positive end-expiratory pressure
	Pressure support
	I:E ratio
	Inspiration trigger
	Expiration trigger
	Period in which the patient can trigger the next breath
	Flow progress
	Pressure increase time


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