MEDUMAT Standard

Step-by-step instructions

• Start ventilation by height
• NIV therapy
• Resuscitation (CPR)
• Anesthesia induction (RSI)

Important:
This document does not replace the instructions for use.
Complete information can be found in the instructions for use.
1. Switch on ventilator

2. Select "New patient"

3. Select patient height and gender

4. Select "next"

5. Select the ventilation mode and check the displayed ventilation parameters

6. Start ventilation
Start ventilation by height

Start faster and ventilate more precisely

From now on, you will not need to spend a long time considering which tidal volume (Vt) is the most appropriate for your patient. With MEDUMAT Standard, you can now initiate ventilation even more precisely and even faster. By entering the patient’s height and gender, your ventilator automatically calculates all the ventilation parameters for the ideal body weight (IBW). The IBW serves as an important indicator when setting the ventilation parameters. MEDUMAT Standard allows you to start ventilation faster and far more precisely – giving you more time for all the other important tasks.

Use presets and work according to guidelines

By using the setting option of the Vt/kg body weight (BW) 4-10 ml/kg BW to be applied, you will be working according to guidelines and determining the calculated tidal volume for volume-controlled ventilation.

The ideal body weight and thus the tidal volume to be applied are calculated differently for male and female patients. The following formula is used for this:

\[
\text{IBW male (in kg)} = 50 + 2.3 \times \left( \frac{\text{Height in cm}}{2.54} - 60 \right) ^ {\text{iii}}
\]

\[
\text{IBW female (in kg)} = 45 + 2.3 \times \left( \frac{\text{Height in cm}}{2.54} - 60 \right) ^ {\text{iii}}
\]

For a 185-cm-tall male patient and a setting of 6 ml/kg BW, the following tidal volume results:

\[
\text{IBW (in kg)} = 50 + 2.3 \times \left( \frac{185}{2.54} - 60 \right) = 79.51 \text{ kg} \sim 80 \text{ kg}
\]

The Vt is obtained accordingly: \( \text{Vt} = 80 \text{ kg} \times 6 \text{ ml/kg} = 480 \text{ ml} \)


1. Switch on ventilator

2. Select "New patient" in the start menu.

3. Set the patient’s height and gender or select the appropriate patient group: Adult, Child, Infant
Select the desired CPAP therapy using the navigation button: PEEP, pMax, ΔpASB. After adjusting the values, begin the ventilation via "start".

Select one of the following ventilation modes: CPAP* or CPAP + ASB (if available).

*pure CPAP is the ventilation form CPAP + ASB with a ΔpASB of 0 mbar

Now connect the patient to MEDUMAT Standard². It is possible to adjust the values using the navigation button while the ventilation is running. You can find other ventilation parameters in the user menu on the right navigation button. If it is necessary to change the ventilation mode, this is done using the "user menu" function button on the right side.
Logistical requirements
Oxygen supply: at least a 2-l bottle, filled ....................................................... Check
Emergency medical team familiar with NIV ..................................................... Check

Clinical requirements
alert, cooperative (GCS > 12) ......................................................................... Check
breathing spontaneously ................................................................................ Check
if applicable, light sedation of agitated patients e.g. morphine
(5-10 mg i.v. titrated) or a short-acting benzodiazepine.

Indications
Dyspnea ......................................................................................................... Check
Respiratory rate > 25/min (count!) ................................................................. Check
SpO₂ < 90% despite O₂ administration ........................................................... Check

Contraindications
Absolute contraindications: ............................................................................ Check
absence of spontaneous respiration, gasping, airway obstruction,
gastrointestinal bleeding or ileus

Relative contraindications: .............................................................................. Check
Coma, massive agitation, hemodynamic instability, severe hypoxemia
(SpO₂ < 75% despite O₂), problems with airway access, status post
gastrointestinal surgery

NIV sequence: Set the device, place the mask on the patient’s face (explain the
measure!), connect the mask to the hose system while the device is running. Aim:
Synchronization of patient and device

Pulmonary edema
Primary device settings
Ventilation mode: ...........................................................................................CPAP
PEEP (according to comfort and oxygenation): ........................................... 5/7/10 mbar
FiO₂: .............................................................................................................. Air Mix or 100%

Aim and success criteria
Target SpO₂: > 90% .......................................................................................... Check
Decrease in dyspnea ........................................................................................ Check
Falling respiratory and heart rate .................................................................... Check
If applicable, improved vigilance...................................................................... Check
**Escalation levels**

In the event of imminent respiratory muscle fatigue, set pressure support (ASB). Immediate intubation in the absence of clinical improvement or the occurrence of contraindications!

**Caution**
- Continuous clinical observation and close patient contact
- No delay in pharmacological therapy or necessary intubation
- Prepared for intubation at any time
- Timely advance information to the receiving hospital

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**Exacerbated COPD**

**Primary device settings**

Ventilation mode: .......................................................... CPAP + ASB
PEEP: ................................................................. 3/6 mbar
ΔpASB (according to comfort and oxygenation): ....................... 5/10/15 mbar
Peak pressure (pMax): ................................................. max. 25 mbar
Inspiration trigger: ........................................................... as low as possible
Pressure ramp: ............................................................ steep
FiO₂: .................................................................................. Air Mix or 100%

**Aim and success criteria**

Target SpO₂: > 85% ................................................................. Check
Decrease in dyspnea ............................................................... Check
Falling respiratory and heart rate ............................................... Check
If applicable, improved vigilance................................................ Check

**Escalation levels**

In the event of imminent respiratory fatigue, if available, set ventilation mode BiLevel + ASB (e.g. PEEP: 5 mbar, pInsp: 20 mbar).
Immediate intubation in the absence of clinical improvement or the occurrence of contraindications!

**Caution**
- Continuous clinical observation and close patient contact
- No delay in pharmacological therapy or necessary intubation
- Prepared for intubation at any time
- Timely advance information to the receiving hospital
Inspiratory trigger

The inspiratory trigger triggers a pressure support or a mechanical breath as soon as inhalation effort is detected.

<table>
<thead>
<tr>
<th>Trigger level</th>
<th>Corresponding unit value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1 (sensitive)</td>
<td>Approx. 3 l/min</td>
</tr>
<tr>
<td>Level 2 (medium)</td>
<td>Approx. 6 l/min</td>
</tr>
<tr>
<td>Level 3 (insensitive)</td>
<td>Approx. 10 l/min</td>
</tr>
</tbody>
</table>

Setting the levels of the inspiration trigger:

(If “3 levels” has been chosen as the trigger setting in the operator menu)
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

Expiratory trigger

Initiate expiration as soon as the flow to the patient is only the set value (in %) with respect to the maximum flow. The length of the pressure support is set with the expiratory trigger.

Trigger sensitivity: 5-80% of max. flow. In principle, the following applies: the smaller the % value, the longer the pressure support lasts.

Setting the levels of the expiration trigger:

(If “3 levels” has been chosen as the trigger setting in the operator menu)

<table>
<thead>
<tr>
<th>Trigger level</th>
<th>Corresponding unit value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1 (long)</td>
<td>Approx. 10% Flow max</td>
</tr>
<tr>
<td>Level 2 (medium)</td>
<td>Approx. 35% Flow max</td>
</tr>
<tr>
<td>Level 3 (Short)</td>
<td>Approx. 70% Flow max</td>
</tr>
</tbody>
</table>
Pressure ramp (pressure increase time)

A pressure ramp (or the pressure increase time) defines the time in which the pressure increases from the PEEP to the inspiration pressure. This pressure increase time can be set by the shape of the ramp: flat, medium and steep.

- < 0.2 seconds: steep
- Approx. 0.2 seconds: medium
- Approx. 0.4 seconds: flat

Pressure ramps using the example of a BiLevel + ASB curve
1. Switch on the device

2. Press the CPR button and select the patient group

3. Check the ventilation parameters. In the ventilation phase of 30:2 or 15:2 resuscitation, press the mask with the "Double C grip" over the patient's mouth and nose. Then hold down the MEDUtrigger key until two mechanical breaths have been administered.
Following successful intubation, change to continuous ventilation and check the ventilation parameters.

During the cardiac rhythm analysis or defibrillation, select "pause" to pause the ventilation.
- No movement artifacts
- Reduction of thoracic impedance
- No oxygen enrichment of ambient air

Following successful defibrillation, if applicable, press "pause" again to restart the ventilation. The ventilation will start automatically after at most 50 seconds.

Once ROSC is achieved, press the CPR key again to exit the CPR mode. Then check the ventilation parameters and select, if applicable, the Air Mix key to lower the FiO₂ to < 1.0.
Advanced Life Support

Unresponsive and not breathing normally?

Call Resuscitation Team

CPR 30:2
Attach defibrillator/monitor
Minimise interruptions

Assess rhythm

Shockable (VF/Pulseless VT)

1 Shock
Minimise interruptions

Immediately resume CPR for 2 min
Minimise interruptions

Non-shockable (PEA/Asystole)

Return of spontaneous circulation

Immediately resume CPR for 2 min
Minimise interruptions

IMMEDIATE POST CARDIAC ARREST TREATMENT
- Use ABCDE approach
- Aim for SaO₂ of 94-98%
- Aim for normal PaCO₂
- 12 Lead ECG
- Treat precipitating cause
- Targeted temperature management

DURING CPR
- Ensure high quality chest compressions
- Minimise interruptions to compressions
- Give oxygen
- Use waveform capnography
- Continuous compressions when advanced airway in place
- Vascular access (intravenous or intraosseous)
- Give adrenaline every 3-5 min
- Give amiodarone after 3 shocks

TREAT REVERSIBLE CAUSES
- Hypoxia
- Hypovolaemia
- Hypo-/hyperkalaemia/metabolic
- Hypothermia/hyperthermia
- Thrombosis – coronary or pulmonary
- Tension pneumothorax
- Tamponade – cardiac
- Toxins

CONSIDER
- Ultrasound imaging
- Mechanical chest compressions to facilitate transfer/treatment
- Coronary angiography and percutaneous coronary intervention
- Extracorporeal CPR

https://cprguidelines.eu/
European Resuscitation Council Guidelines for Resuscitation 2015
Monsieurs, Koenraad G.Khalifa, Gamal Eldin Abbas et al. Resuscitation , Volume 95 , 1 - 80
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Anesthesia induction (RSI)

1. Switch on the device

2. Select "New patient" on the home screen and set the patient’s height and gender. Or select the appropriate patient group: Adult, Child, Infant.

3. Select "RSI" in the "mode" submenu

4. MEDUMAT Standard² begins the therapy in demand mode. In this mode, the spontaneously breathing patient is pre-oxygenated. The total RSI time and the time since the last spontaneous breath are shown on the display.
To check the tube position following successful intubation or as a fallback position for a difficult airway, change to the manual mode.

Check the ventilation parameters. Connect the patient hose system to the tube or press the mask with the “Double C grip” over the patient’s mouth and nose and trigger the mechanical breath with the

Following successful intubation, change to continuous ventilation to ventilate the patient in a controlled manner.

The device changes to controlled IPPV or BiLevel + ASB ventilation depending on availability and setting. Please check the ventilation parameters and adjust them if necessary.
Excerpt from the S1 guideline
"Pre-hospital emergency anesthesia in adults" of the German Association for Anesthesiology and Intensive Care Medicine (DGAI)

Indications for pre-hospital emergency anesthesia
- Acute respiratory insufficiency (hypoxia and/or respiratory rate* < 6 or > 29/min) and contraindications for or failure of non-invasive ventilation (NIV)
- Loss of consciousness/neurological deficit with risk of aspiration
- Multiple trauma/severe trauma with
  i) hemodynamic instability, systolic BP < 90 mmHg or
  ii) hypoxia with SpO₂ < 90% despite = 2 l/min O₂ administration or
  iii) traumatic brain injury with GCS < 9

* in the presence of not rapidly reversible causes

**Indication:** patient, application and user-related factors, experience of the emergency medical team, situation at the scene, transport times, air and ground rescue

**Communication in the team:** Site of anesthesia induction, clear allocation of tasks, selection of medicines, other important notes and agreements

**Optimal positioning:** "Light, space, warmth" concept, ideal for upper body elevation in the ambulance (caution: not with spinal immobilization or hemodynamically unstable patients), head in "sniffing" position.

**Pre-oxygenation:** For a spontaneously breathing patient, at least 3-4 min O₂ insufflation with 12-15 l/min via a face mask with reservoir or demand valve, if applicable, NIV or mask ventilation

**Standardized preparation:** Anesthetic and emergency medicine, alternative airways, suction, capnography.

**Monitoring:** Pulse oximetry, ECG, blood pressure, capnography

**Two peripheral venous accesses:** In case of difficult puncture conditions, consider intraosseous puncture in a time-critical manner.

**Rapid Sequence Induction (RSI)**

**Continuous monitoring:** Anesthesia management and monitoring

if required

**Management of complications**
Rapid Sequence Induction (RSI)

- If applicable, remove the cervical spine immobilization and begin manual in-line stabilization
- Announcement of the anesthetic medicine with active substance and dosage, step-by-step application
- Wait for loss of consciousness and relaxation effect
- Airway management without intermediate ventilation in normoxic patients*
- Tube position check (capnography, auscultation, insertion depth)
- If applicable, stop manual in-line stabilization and close the cervical spine immobilization brace again

* In individual cases, despite the increased risk of aspiration, intermediate ventilation may be necessary in order to maintain oxygenation.

Please note that these are excerpts from the S1 guideline “Pre-hospital emergency anesthesia in adults”.

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