

MEDUMAT Transport

Emergency ventilator

**MEDUMAT Transport
with CO₂ measurement**

WM 28400

**MEDUMAT Transport
without CO₂ measurement**

WM 28300

Description and Operating Instructions

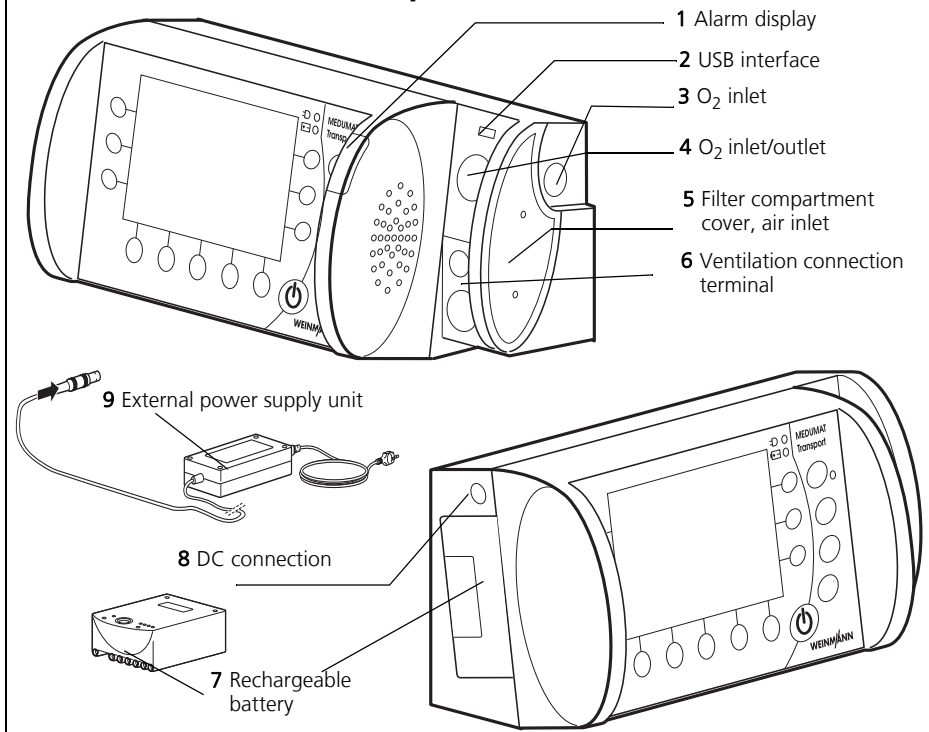
Contents

1. Overview	4	
2. Description	15	
2.1 Intended use	15	
2.2 Applications	15	
2.3 User qualification	16	
2.4 Function	16	
3. Installation	18	
3.1 Connecting oxygen cylinder	18	
3.2 Hose system	20	
3.3 Accessories from other manufacturers	21	
3.4 Permanent installation of the unit	23	
4. Safety information	24	
5. Operation	28	
5.1 Controls	28	
5.2 Switching the unit on/Self-test	31	
5.3 Navigating in menus	33	
5.4 Emergency modes	35	
5.5 Selecting a ventilation mode	36	
5.6 Pressure-controlled ventilation modes	38	
5.7 Volume-controlled ventilation modes	42	
5.8 Other ventilation functions	46	
5.9 Performing ventilation	48	
5.10 Monitoring ventilation	49	
5.11 Alarm signals	51	
5.12 Ventilation with filters (not supplied with the unit)	52	
5.13 Ending ventilation	52	
5.14 Calculating the oxygen level/operating time	53	
5.15 Alternative ventilation	55	
5.16 Changing battery during use	55	
5.17 Battery management	56	
6. Configuring the unit	60	
6.1 Automatic alarm limits	60	
6.2 Setting alarm limits	61	
6.3 Setting the presentation of ventilation values (only with units with etCO ₂ measurement)	62	
6.4 Setting advanced respiratory parameters	63	
6.5 "Night colors" display mode	66	
6.6 Setting the display brightness and the volume	67	
6.7 Options	68	
7. Hygienic preparation	70	
7.1 MEDUMAT Transport	70	
7.2 Hose systems	70	
7.3 Parts and accessories	71	
7.4 Fittings	71	
7.5 Cleaning, disinfection and sterilization	72	
8. Function check	74	
8.1 Intervals	75	
8.2 Checking the system for leaks	75	
8.3 Checking the patient valve (only reusable hose system)	77	
8.4 Automatic function check	77	
9. Troubleshooting	80	
9.1 Troubleshooting	80	
9.2 Physiologic alarms	81	
9.3 System alarms	82	
10. Maintenance	85	
10.1 MEDUMAT Transport	85	
10.2 Batteries	86	
10.3 Accessories	86	
10.4 Changing the suction filter	87	
10.5 Storage	88	
10.6 Disposal	88	
11. Product, accessories	89	
11.1 Standard scope of supply	89	
11.2 Accessories	90	
11.3 Replacement parts	93	
12. Technical Data	95	
12.1 Specifications	95	
12.2 Block diagram	99	

12.3	Separation distances	99
12.4	O ₂ consumption of the unit	100
12.5	Possible O ₂ concentration with counterpressure	100
12.6	Attainable tidal volume with counterpressure	101
13.	Warranty	102
14.	Declaration of Conformity	103

1. Overview

Connections on MEDUMAT Transport



1 Alarm display

Glows to indicate alarms.

2 USB interface

Means of data transfer for servicing and maintenance purposes.

3 O₂ inlet

Connection point, e.g., for an oxygen cylinder.

4 O₂ inlet/outlet

At this connection point, oxygen can be extracted, e.g., using an inhalation device, or an oxygen source can be connected.

5 Filter compartment cover, air inlet

Covers the filter and ensures it is securely positioned.

6 Ventilation connection terminal

The tube system is connected here.

7 Rechargeable battery

Provides mobile power supply to the unit.

8 DC connection

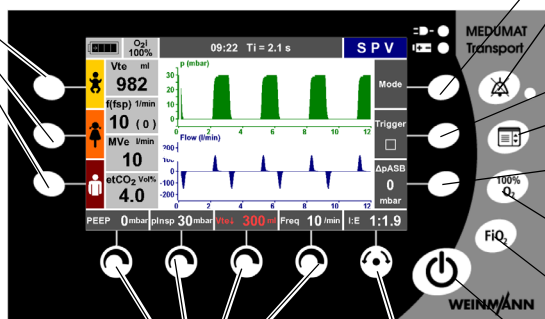
For DC power supply via an external power supply unit or via the electrical circuit of an ambulance or rescue vehicle.

9 External power supply unit

Provides power supply to the unit via a 100V - 240V grid.

Controls of MEDUMAT Transport

11 Function buttons for emergency ventilation



1 Context-dependent function button

2 Alarm mute button with LED

3 Context-dependent function button

4 Function button for main menu

5 Context-dependent function button

6 Function button for 100% O₂

7 Function button for inspiratory O₂ concentration

10 Context-dependent control knobs

9 Navigation knob

8 On/Standby/Off button

1, 3, 5 Context-dependent function button

These buttons are used to set various ventilation parameters, depending on the ventilation mode selected.

2 Alarm mute button with LED

With this button, acoustic alarms can be muted briefly (for 2 minutes). If alarms are muted, the LED lights up. Visual alarms are still displayed.

4 Function button for main menu

This button calls up the main menu.

6 Function button for 100% O₂

This button calls up the 100% O₂ function to ventilate the patient briefly (2 minutes) with 100% O₂ (FiO₂ = 1.0).

7 Function button for inspiratory O₂ concentration

This button calls up the O₂ concentration menu. The required inspiratory O₂ concentration in the respiratory gas can be set in this menu.

8 On/Standby/Off button

A short press switches the unit on and off. A long press switches it off completely.

9 Navigation knob

For navigating in menus and confirming your settings on the unit. During ventilation, this knob is to set the I:E ratio.

10 Context-dependent control knobs

For setting various parameters, depending on which ventilation mode is active. Settings made here must be confirmed with the Navigation knob.

11 Function buttons for emergency ventilation

These buttons start emergency ventilation. By pressing the buttons, preset parameters for infants, children or adults are activated.

Display of MEDUMAT Transport

8 Indicator for inspiratory O₂ concentration (FiO₂)

9 Info field

10 Mode indicator

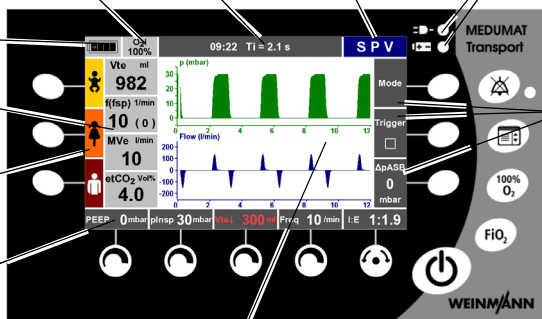
1 Battery/Line operation indicators

7 Battery charge status

6 Numeric measurement display

5 Function indicator for context-dependent function buttons

4 Function indicator for context-dependent control knobs



3 Ventilation progress display

2 Function indicator for context-dependent function buttons

1 Battery/Line operation indicators

Indicates whether the unit is being operated with the external power supply unit (upper LED) or with the internal battery (lower LED).

2 Function indicator for context-dependent function buttons

The currently available function of the context-dependent function buttons is indicated here.

3 Ventilation progress display

Here, the ventilation progress is displayed in up to three graphs (ventilation pressure, ventilation flow, CO₂ concentration), depending on the ventilator version. In the case of emergency ventilation, a pressure gauge is displayed.

4 Function indicator for context-dependent control knobs

The currently available function of the context-dependent control knobs is indicated here.

5 Function indicator for context-dependent function buttons

The three directly selectable emergency ventilation modes (infant, child, adult) are indicated here.

6 Numeric measurement display

The current measurements are indicated numerically here.

7 Battery charge status

The battery charge status is indicated here.

8 Indicator for inspiratory O₂ concentration (FiO₂)

The inspiratory O₂ concentration (FiO₂) is indicated here.

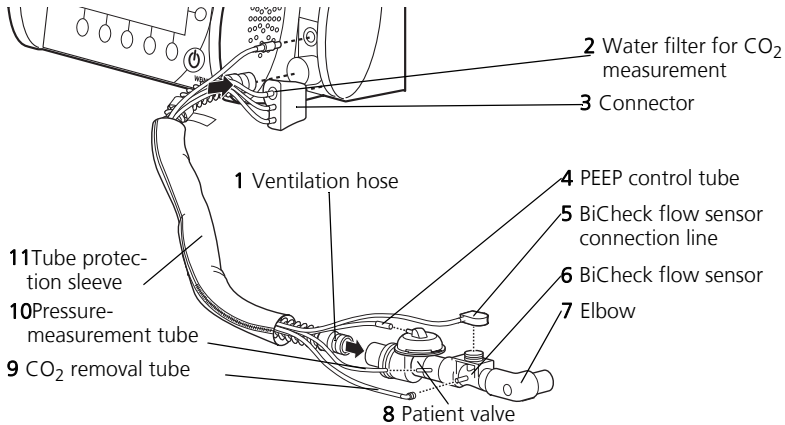
9 Info field

Information (error messages, visual alarms) about the state of the patient and the ventilator is displayed here. The time of day is also displayed in this field.

10 Mode indicator

The ventilation mode set by the user is indicated here.

Hose system (reusable and disposable versions available)



1 Ventilation hose

The respiratory gas flows through the respiration tube to the patient valve.

2 Water filter for CO₂ measurement

The water filter protects the measuring chamber of the MEDUMAT Transport against moisture from the patient's respiratory gas.

3 Connector

The measurement-tube system is connected to MEDUMAT Transport by means of this connector.

4 PEEP control tube

With this tube, MEDUMAT Transport controls the patient valve and the PEEP.

5 BiCheck flow sensor connection line

This electric lead transfers the measuring signals from the BiCheck flow sensor to the MEDUMAT Transport.

6 BiCheck flow sensor

This sensor supplies monitoring data on flow, MV_e , V_{te} and f .

7 Elbow

The mask/tube is connected here. The elbow is removable, i.e., the mask/tube can also be connected to the BiCheck flow sensor itself, depending on the position of the patient.

8 Patient valve

Switchover between inspiration and expiration happens here.

9 CO₂ removal tube

Test gas is removed via this tube if your unit is equipped with the optional CO₂ measurement facility.

10 Pressure- measurement tube

For patient-side measurement of ventilation pressure.

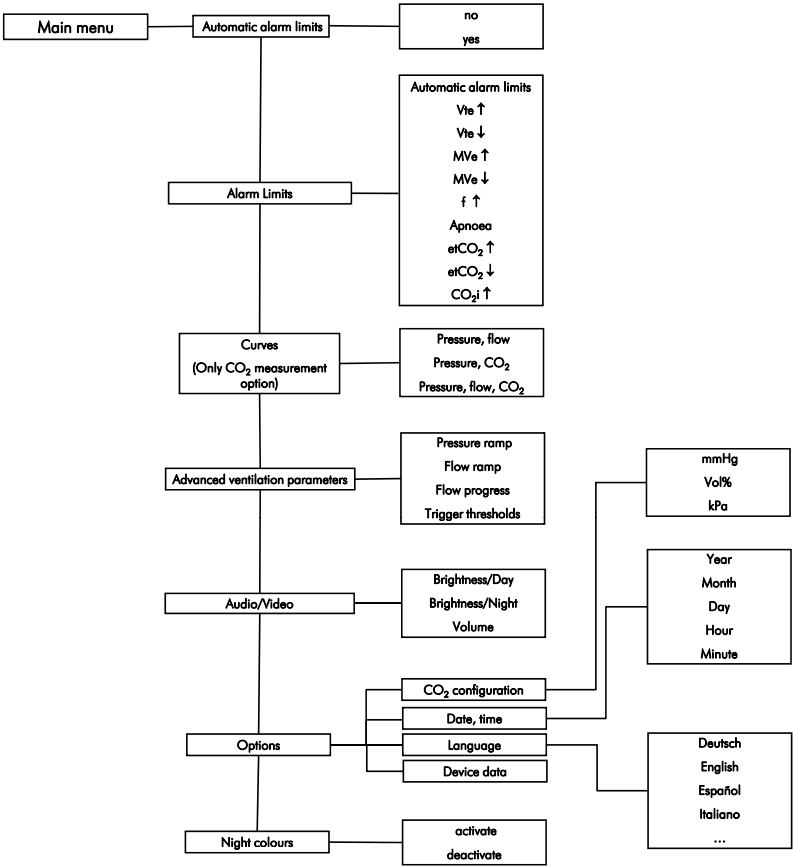
11 Tube protection sleeve

Protects tubes and leads against soiling and damage.

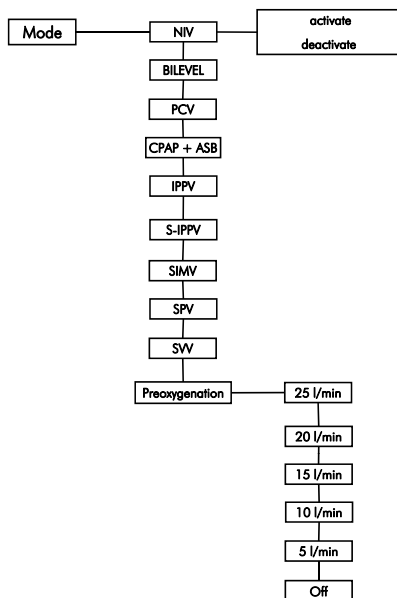
Note

Detailed information about the hose systems can be found in the "Patient Hose System" instruction manual WM 6696.





MEDUMAT Transport Main menu











Mode menu



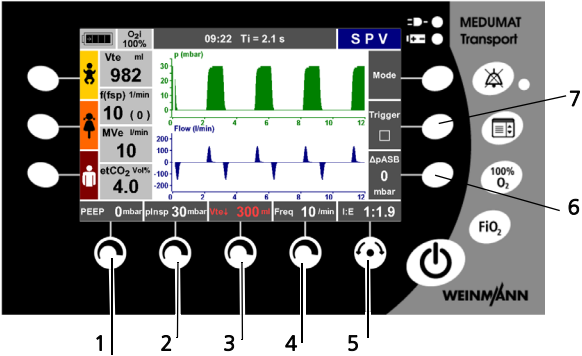
Symbols used on the display

Symbol	Meaning
	Emergency mode - Infant
	Emergency mode - Child
	Emergency mode - Adult
	Battery status indicator

Symbol	Meaning
	Tick box: option activated
	Radio button: function selected
	Navigate upwards
	Navigate downwards
	Increase value
	Decrease value
	Confirm your selection
	Navigation knob active

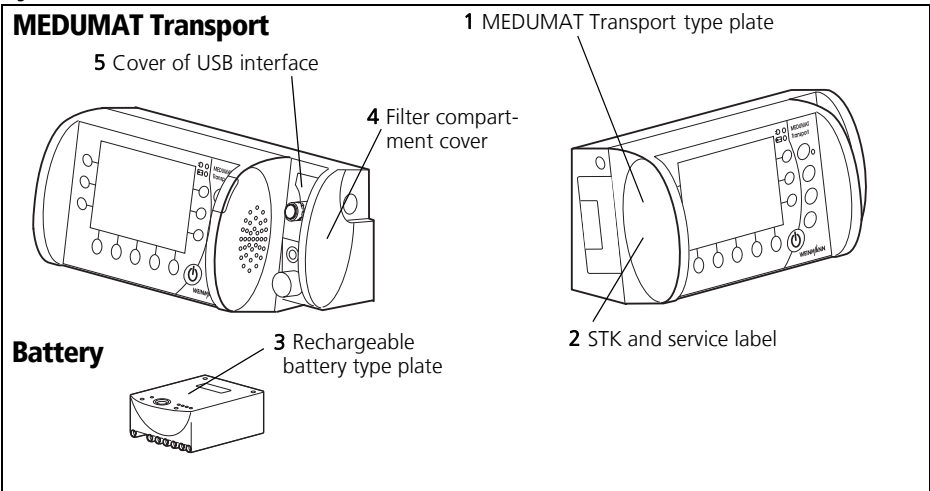
Function of the controls during ventilation

Depending on the ventilation mode selected, you can set the following ventilation parameters using the controls:








Ventilation mode	Control knob 1	Control knob 2	Control knob 3	Control knob 4	Navigation knob 5	Function button 6	Function button 7
SVV	PEEP	p_{\max}	V_t	Freq.	I:E and Selection/ Confirmation	Δp_{ASB}	Trigger
SPV	PEEP	p_{Insp}	V_{tmin}	Freq.	I:E and Selection/ Confirmation	Δp_{ASB}	Trigger
CPAP + ASB	CPAP	-	V_{tmin}	-	Only Selection/ Confirmation	Δp_{ASB}	-
BILEVEL	PEEP	p_{Insp}	V_{tmin}	Freq.	I:E and Selection/ Confirmation	Δp_{ASB}	Trigger
PCV	PEEP	p_{Insp}	V_{tmin}	Freq.	I:E and Selection/ Confirmation	-	-
IPPV	PEEP	p_{\max}	V_t	Freq.	I:E and Selection/ Confirmation	-	-
S-IPPV	PEEP	p_{\max}	V_t	Freq.	I:E and Selection/ Confirmation	-	-
SIMV	PEEP	p_{\max}	V_t	Freq.	I:E and Selection/ Confirmation	-	-


Symbols used on the unit



	Symbol	Meaning
	MEDUMAT Transport type plate	
1		Year manufactured
1		Type BF device
1		Do not dispose of the unit in the household waste
2		Service label: indicates when the next service is required.
2		STK label: (only in the Federal Republic of Germany) indicates when the next safety check in accordance with §6 Medical Device Operator Ordinance (MPBetreibV) is required.
1, 4, 5		Observe the information in the instruction manual.

	Symbol	Meaning
Rechargeable battery type plate		
3		Do not dispose of the unit in the household waste.
3		Do not subject the unit to hard knocks or shocks.
3		Do not open the unit using force.
3		Protect the unit against heat.
3		Protect the unit against moisture.

Labeling on the packaging

Symbol	Meaning
MEDUMAT Transport:	
SN	Serial number of the unit
	Permissible storage temperature: -30°C to +70°C
RH % 0-95	Permissible humidity for storage: up to 95% relative humidity

Safety information in this manual

The safety instructions in this instruction manual are marked as follows:



Warning!

Warns of risk of injury and possible damage to the unit.

Caution!

Warns of material damage and possibly incorrect therapy results.

Note:

Offers useful tips.

2. Description

2.1 Intended use

The MEDUMAT Transport is an automatic oxygen emergency ventilator with additional preoxygenation and monitoring functions (pressure, flow and CO₂).

MEDUMAT Transport is used for controlled and assisted, as well as for invasive and non-invasive, ventilation of persons with a respiratory volume of 50 ml upwards.

MEDUMAT Transport must only be operated when installed permanently or on approved portable systems.

2.2 Applications

MEDUMAT Transport can be used in the following cases:

Emergency

- for resuscitation at the place of the emergency
- for longer-term use in continuing emergency situations
- for preoxygenation via a ventilation mask

Transport

- in ground, sea and air emergency medical service
- between hospital rooms and departments
- between a hospital and other locations (secondary transport)

Short-term ventilation in hospitals

- recovery room
- intensive care unit
- surgery preparation and follow-up
- emergency department

MEDUMAT Transport is also suitable for gentle ventilation of anesthetized patients (TIVA: total intravenous anesthesia).

2.3 User qualification

MEDUMAT Transport must only be used by persons who can verify that they have the following qualifications:

- A medical qualification and training in ventilation techniques.
- Training in the use of the MEDUMAT Transport by a person authorized by WEINMANN.

Improper use may lead to serious physical injury.

2.4 Function

The unit

MEDUMAT Transport is used to treat apnea and to provide respiratory support. By means of adjustable ventilation parameters, the unit ensures uniform ventilation tailored to the patient.

Four pressure-controlled ventilation modes (SPV, CPAP + ASB, BIPAP, PCV) and four volume-controlled ventilation modes (SVV, IPPV, S-IPPV, SIMV) can be selected to provide optimum patient ventilation.

In CPAP + ASB mode, the unit enables assisted spontaneous breathing with continuous positive airway pressure and respiration-controlled oxygen inhalation. In addition, the unit permits O₂ inhalation for preoxygenating the patient.

The unit allows the oxygen concentration of the respiratory gas to be adjusted.

Depending on the version, the unit's large display can show up to three spirometric graphs (pressure, flow and CO₂).

For emergency situations, rapid selection of default types of ventilation is possible.

Patient Hose System

The ventilation gas is supplied to the patient via the Patient Hose System, comprising the ventilation hose and all leads necessary for comprehensive ventilation and monitoring.

The Patient Hose System is designed to permit spontaneous respiration even if the MEDUMAT Transport malfunctions.

The Patient Hose System is available in two versions:

- Reusable hose system
- Disposable hose system

3. Installation

As a rule, MEDUMAT Transport only has to be installed for stationary use in rescue vehicles, helicopters or aircraft. In this case, fastening sets can be supplied as accessories.

If MEDUMAT Transport is supplied complete on a portable system, the unit is ready for operation and no further installation work is required. There are separate instruction manuals for the portable systems.

Warning!



After installation, you must perform a functional check (see "8. Function check" on page 74) to ensure reliable operation.

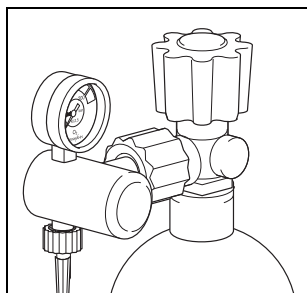
3.1 Connecting oxygen cylinder

Warning!



- **Risk of explosion!** Wash your hands thoroughly before doing any work on the oxygen supply. Hydrocarbon compounds (e.g. oil, grease, cleaning alcohol, hand cream or adhesive plasters) can cause explosive reactions if they come into contact with highly compressed oxygen.
- Never use wrenches or other tools to tighten or unscrew the union nuts.

Removing the empty cylinder



1. Close the valve on the oxygen cylinder.

Switch on MEDUMAT Transport at the On/Standby/Off switch. This allows the remaining oxygen to escape and the unit is pressure-free. Only when the contents gauge on the pressure reducer indicates **0** bar, can the screwed union be undone by hand.

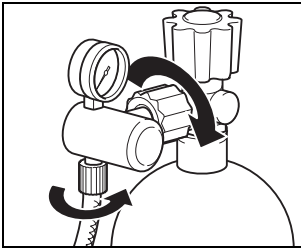
2. Switch MEDUMAT Transport off again.
3. Undo the screwed union at the cylinder by hand.

Connecting a new cylinder

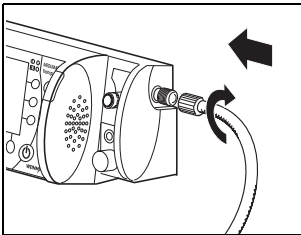
1. Briefly open the valve of the new oxygen cylinder, then shut it again. This is to blow away any particles of dust.

Caution!

- Make sure that the patient is not connected up to the MEDUMAT Transport when you are establishing the gas supply. Otherwise, the unit's automatic self-test will lead to incorrect results.
- When doing this, hold the valve opening away from your body in such a way that any flying particles cannot injure yourself or other people!



2. Screw the pressure reducer to the cylinder valve using the knurled union nut. Tighten the union nut by hand.
3. Screw the pressure hose onto the outlet of the pressure reducer (if not already connected) using the G 3/8 union nut.



4. Screw the other end of the pressure hose to the compressed gas connection of the MEDUMAT Transport (if not already connected).

Connecting a second oxygen source

Caution!

- **Risk of insufficient oxygen supply**
Two oxygen sources can be connected to this unit simultaneously. Make sure that only **one** oxygen source is open at any given time and that there is no gas reflux. Otherwise, one of the oxygen sources may empty itself unnoticed. Sufficient oxygen supply to the patient can then no longer be guaranteed when the unit is in use.

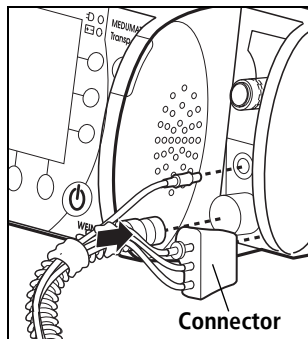
If desired or if foreseen in your establishment, you can connect a second oxygen source, e.g., an oxygen cylinder or a CGC to the O₂ inlet/outlet (quick connector to the front of the unit).

Note:

If your unit is equipped with a DIN quick connector, no oxygen can be fed into the unit with the associated DIN gas probe. With this combination it is only possible to draw off oxygen.

3.2 Hose system

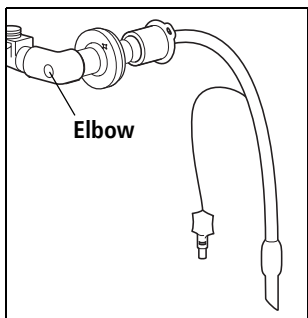
A reusable hose system is supplied with the MEDUMAT Transport. Optionally, a disposable hose system is also available. The procedure for connecting both systems is as follows:



1. Press the ventilation hose onto the corresponding connection on the unit.
2. Attach the connector of the BiCheck flow sensor connection line to the corresponding connection on the unit.
3. Press the connector (contains PEEP control line, CO₂ removal tube, pressure-measurement tube) onto the corresponding connection on the unit. Make sure that the connected tubes are not kinked.

Caution!

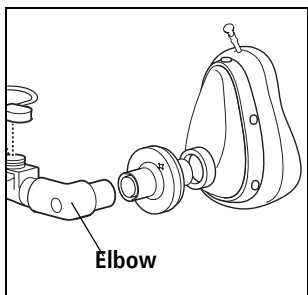
Only grip the ventilation hose by its ends. Otherwise the hose may be damaged.



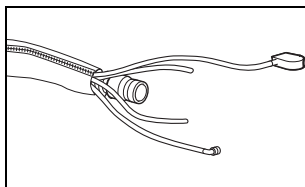
4. Connect the patient valve with BiCheck flow sensor to the hose following intubation. If performing mask ventilation, attach the ventilation mask to the patient valve with the BiCheck flow sensor (identical to tube connection).

Note!

You can remove the elbow to reduce the dead space or to adapt the hose routing to suit the patient's position.



Tube protection sleeve



The tube protection sleeve is pulled over the ventilation hose with connected BiCheck flow sensor. It prevents the hose system from tangling on other items of equipment and being damaged.

Water filter for CO₂ removal tube

The water filter WM 97012 loses efficiency after approx. 8 hours of continuous operation, depending on the temperature, humidity and any coarse particles, such as mucus.

Change the filter after eight hours at the latest.

The filter's decreasing efficiency is indicated by the alarm message "CO₂ occlusion" on the display. This message is accompanied by a low-priority audible alarm

3.3 Accessories from other manufacturers

Caution!

The unit's USB interface is intended exclusively for use by the manufacturer or an authorized technician for servicing work. Do not connect equipment of any sort to the USB, as this will interfere with operation of the unit, putting the patient at risk.

HME filter/bacterial filter/combined HME bacterial filter

If a filter is used, install it between the patient connection of the BiCheck flow sensor (optionally with elbow) and the tube or mask. Follow the manufacturer's instructions.

Ventilation mask

Attach the ventilation mask to the BiCheck flow sensor. The mask used must have a standard connection, as per ISO 5356-1.

Laryngeal mask

You can use a laryngeal mask instead of a ventilation mask. The tube used must have a standard connection, as per ISO 5356-1.

Endotracheal tube

Instead of attaching the BiCheck flow sensor to a ventilation mask, you can attach it to an endotracheal tube. The tube used must have a standard connection, as per ISO 5356-1.

Tracheostomy tube

Instead of attaching the BiCheck flow sensor to a ventilation mask, you can attach it to a tracheostomy tube. The tube used must have a standard connection, as per ISO 5356-1.

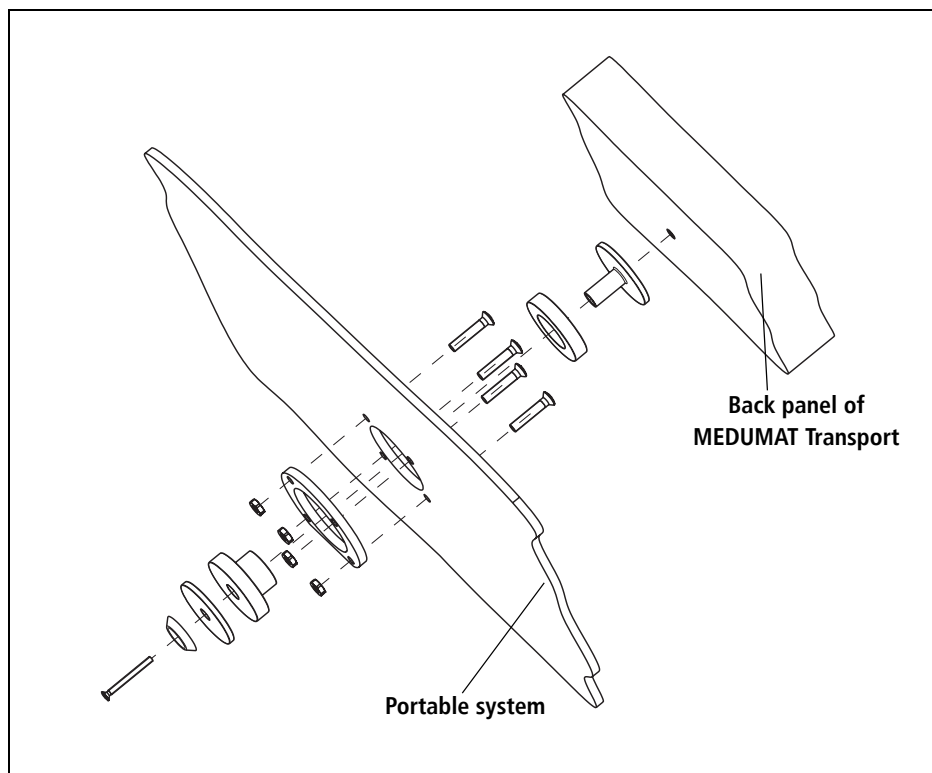
Supplying oxygen to external units

You can use the O₂ inlet/outlet to connect the units, modules or inhalation devices to the MEDUMAT Transport (quick connector on the front of the units).

When doing so, bear in mind that the outlet gas flow reduces the efficiency of the gas supply (see 11.5 “Required gas supply” on page 95).

3.4 Permanent installation of the unit

If you wish to install the unit on a portable system or permanently install it in a vehicle or aircraft, you require the fastening set WM 15730.



4. Safety information

Read this instruction manual carefully. It is part of the unit and must be available at all times.

For your own safety and that of your patients, and in accordance with the requirements of Directive 93/42/EEC, please observe the following points:

General

- Always carry out a functional check before using the unit (see "8. Function check" on page 74).
- Please observe the section "7. Hygienic preparation" on page 70 in order to avoid infection or bacterial contamination.

Warning!



- **Risk of injury.** Only use MEDUMAT Transport if you are a qualified medical professional and have received training in respiration techniques. Improper use may lead to serious physical injury.
- **Risk of injury.** Never leave the patient or the ventilator unattended during ventilation. Only then can you respond quickly if the patient's condition deteriorates or in the event of an alarm or malfunction. Delayed response on the part of medical personnel may lead to serious physical injury.
- Only use MEDUMAT Transport for the designated purpose (see "2.1 Intended use" on page 15).
- MEDUMAT Transport is not suitable for hyperbaric use (pressure chamber).
- The unit is not licensed for use in explosive atmospheres. The unit must not be used in combination with flammable gases or anesthetics.
- The unit is not licensed for use in poisonous or contaminated atmospheres.
- Only have modifications to the unit carried out by the manufacturer, WEINMANN, or by a technician expressly authorized by WEINMANN.

Caution!

- Do not place a switched-on cellular phone or radio closer than 1 m from the MEDUMAT Transport, as this could cause malfunctions.
- Remember that the respiratory resistance of the system as a whole may increase beyond the level specified by the standard when an HME filter

(heat and moisture exchanger), a bacterial filter or a combined HME bacterial filter is used.

- When operating the unit with the power supply unit, always connect the unit to an easily accessible outlet so that it can be unplugged quickly in the event of a malfunction.
- When operating the unit with the power supply unit, make sure that the power cord cannot cause anyone to trip or cause any obstruction. If necessary, do not use an external power supply, but operate the unit with the battery instead.
- When operating the unit with the 12 V supply cord, always connect the unit to an easily accessible vehicle electrical system receptacle so that it can be unplugged quickly in the event of a malfunction.
- When operating the unit with the 12 V supply cord, make sure that the cord cannot cause anyone to trip or cause any obstruction. If necessary, do not use the vehicle electrical system, but operate the unit with the battery instead.
- A spare unit must always be kept ready for use in case of failure.
- After using the unit in a dusty environment (e.g., a gravel plant), change the suction filter, as described in the section "10.4 Changing the suction filter" on page 87.

Safe handling of oxygen

Warning!



- **Risk of explosion!** In combination with combustible substances (grease, oil, alcohol etc.), highly compressed oxygen may give rise to spontaneous explosive reactions.
- **Risk of fire!** If only the O₂ inlet/outlet is used, close the O₂ inlet on the side with a suitable cap. Otherwise, oxygen will escape from the O₂ inlet on the side.
- **Risk of poisoning!** Highly concentrated oxygen can have a toxic effect on the patient if administered for too long and depending on the age of the patient. When ventilating with pure oxygen or an oxygen-air mixture, make sure that oxygen is only administered for an appropriate period.
- Keep the units and all screwed unions absolutely free from oil and grease.
- Be sure to wash your hands before working on the oxygen supply.
- Smoking and open flames are strictly prohibited in the vicinity of fittings containing oxygen.

Caution!

- When assembling the unit, and when changing cylinders, tighten all screwed unions on the oxygen cylinder and pressure reducer by hand only. Never use tools. Overtightening damages the threads and seals, resulting in leaks.
- Secure the oxygen cylinders so that they cannot fall over. If a cylinder falls on the pressure reducer or valve, these could break off, causing a violent explosion.
- **Risk of insufficient oxygen supply**
Two oxygen sources can be connected to this unit simultaneously. Make sure that only **one** oxygen source is open at any given time and that there is no gas reflux. Otherwise, one of the oxygen sources may empty itself unnoticed. Sufficient oxygen supply to the patient can then no longer be guaranteed when the unit is in use.
- Always open the cylinder valve slowly to prevent pressure hammer on the fittings.
- Do not empty oxygen cylinders completely, as this may allow moist ambient air to enter and cause corrosion.

Ventilation/Handling

- Patient and emergency ventilator must be kept under continuous observation during ventilation.
- Prolonged ventilation can lead to atrophy of the muscles (dependency of the patient on ventilation).
- Prolonged ventilation may lead to the airway drying out. Ensure adequate conditioning of the respiratory air.
- Only apply high ventilation pressures for short periods and only if medically indicated. Permanently applied high ventilation pressures can be injurious to the patient.
- Make sure that the patient valve is not covered or its function impaired, e.g. by the patient's position.

Patient Hose System

Warning!



- **Risk of injury.** Only use the Patient Hose System if you are a qualified medical professional and have received training in respiration techniques. Improper use may lead to serious physical injury.
- The Patient Hose System must be subjected to a functional check and visual inspection by the user before use. For this, refer to the instruction manual for the Patient Hose System.
- When connecting the patient valve, check that the direction of flow of the respiratory gas is correct. Make sure that the expiration opening of the patient valve is not covered or prevented from functioning, e.g., by the patient's position.
- Only use the Patient Hose System for the purpose described. For this, refer to the instruction manual for the Patient Hose System.
- The Patient Hose System is not suitable for hyperbaric use (pressure chamber).
- Also refer to the instruction manual for the Patient Hose System.

Software

- Risks due to software errors have been minimized by means of extensive qualification measures.

Accessories/Repairs/Replacement parts

Caution!

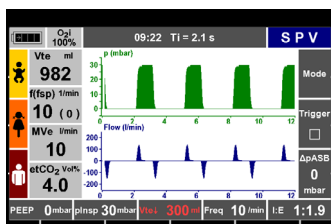
- Protect silicone/rubber parts against UV light and prolonged direct exposure to sunlight to prevent them becoming brittle.
- We recommend that work such as inspections and repairs should be carried out by the manufacturer, WEINMANN, or by a technician expressly authorized by WEINMANN.
- If third-party items are used, functional failures may occur and fitness for use may be restricted. Biocompatibility requirements may also not be met. Please note that in such cases, any claim under warranty and liability will be voided if neither the accessories nor genuine replacement parts recommended in the instructions for use are used.

5. Operation

5.1 Controls

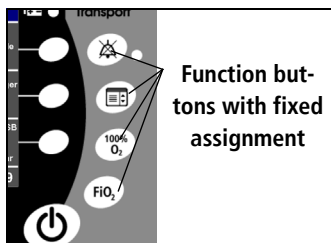
Display

The display contains the following information while the unit is in use.



- Progress of the current ventilation
- Current measurements
- Ventilation parameters set/to be set
- Current assignment of the context-dependent function buttons and control knobs
- Alarms and error messages

Function buttons with fixed assignment

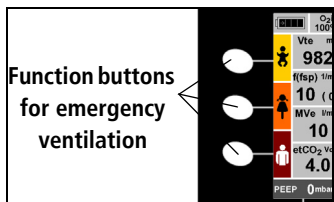


The fixed-assignment function buttons enable you to carry out the following actions directly:

- Mute acoustic alarms
- Call up the main menu
- Activate the "100% O₂" function
- Call up the "O₂ concentration" menu

Context-dependent function buttons

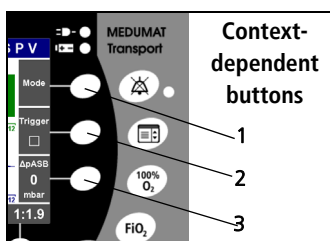
On both sides of the display there are context-dependent function buttons for calling up the following functions:



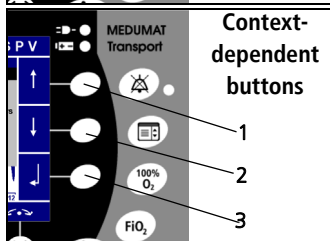
Left side of the display:

- Selecting emergency modes (available in every ventilation mode):
 - Infant (approx. 10 kg)
 - Child (approx. 25 kg)
 - Adult (approx. 75 kg)

Right side of the display:

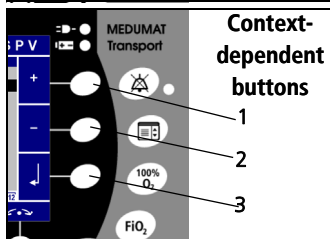


- Calling up menus during ventilation:
 - Button 1: Selecting a ventilation mode
 - Button 2: Activating/deactivating triggers in SVV, SPV, BILEVEL modes
 - Button 3: Setting the pressure level of the ASB function (ASB=Assisted Spontaneous Breathing in SVV, SPV, BILEVEL and CPAP + ASB modes)



- Navigating in a menu:
 - Button 1: Up
 - Button 2: Down
 - Button 3: Confirm your selection

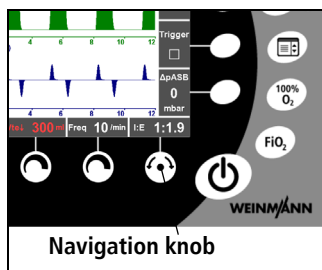
Alternatively, these settings can also be made with the navigation knob (Dual Navigation).



- Setting a parameter:
 - Button 1: Increase value
 - Button 2: Decrease value
 - Button 3: Confirm your selection

Alternatively, these settings can also be made with the navigation knob (Dual Navigation).

Navigation knob



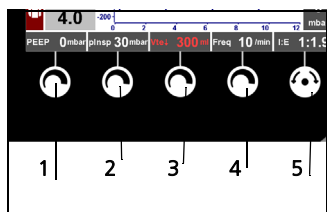
When a menu is open, you can navigate using the navigation knob, as follows:

- Turn counterclockwise: to move the selection bar upwards in the menu
- Turn clockwise: to move the selection bar downwards in the menu
- Press navigation knob to confirm your selection

When no menu is open, you can carry out the following functions:


- Confirm setting parameters that have been set with the context-dependent control knobs.
- Set and confirm the I:E ratio


Context-dependent control knobs



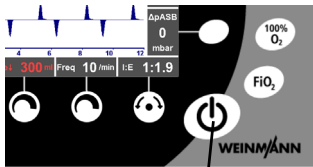
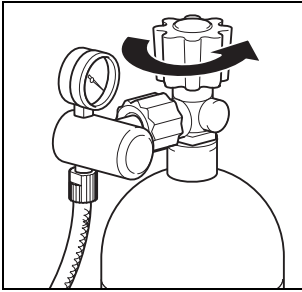
Depending on the ventilation mode selected, you can set the following parameters using the control knobs:

- Control knob 1: PEEP, CPAP
- Control knob 2: p_{\max} (alarm limit), $P_{i\text{insp}}$. In some ventilation modes, this knob has no function
- Control knob 3: V_t , $V_{te} \downarrow$ (alarm limit)
- Control knob 4: Respiratory rate (no function in some modes)
- Navigation knob 5: I:E (no function in some modes)

If the ventilation parameters are changed using the control knobs, the corresponding parameters and the  above the navigation button will flash for 5 seconds.

Changed parameters that are not confirmed within 5 seconds by the navigation button or the context-dependent button  will not be applied.

5.2 Switching the unit on/Self-test



On/Standby/Off button

1. **Slowly** open the valve on the oxygen cylinder. The contents gauge now indicates the cylinder pressure.

2. Calculate the remaining operating time (see 5.14 "Calculating the oxygen level/operating time" on page 53). You should change the cylinder in good time, e.g., when the pressure falls below 50 bar, to ensure a sufficiently long operating time.

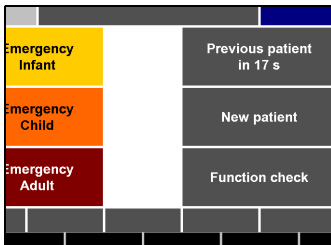
3. To switch on MEDUMAT Transport, press the On/Standby/Off button. An automatic self-test runs.

During the self-test, the alarm LED lights up briefly. The buzzer gives a series of five signals and then the loudspeaker gives two acoustic signals.

If the self-test is not successful, the "Fault" message appears in the display. The unit cannot then be operated.

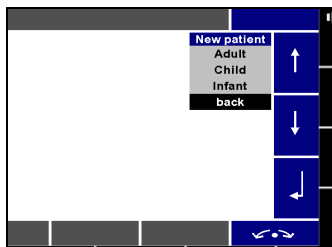
Caution!

The automatic self-test is not a substitute for the functional check. Before using the unit, always carry out a functional check, as described in Section "8. Function check" on page 74. That is the only way to ensure that the unit is fully functional.



4. The "Start menu" appears on the display. You now have the following options:

- Press one of the emergency buttons (Infant, Child, Adult). The unit immediately begins ventilation with preset parameters.
- Do not make any selection: after 20 seconds the "Start menu" will disappear. The unit begins ventilation in the mode that was last selected and with the parameters last set.




- Press the “Last patient” button: The unit immediately begins ventilation in the last mode selected.
 - Press the “New patient” button: Then select the “Adult”, “Infant” or “Child” setting. The “Mode” menu appears. Select the appropriate ventilation mode and confirm your selection. Use the control knobs to set the parameters for ventilating the patient. Then select “Start ventilation” with the context-dependent buttons if you are ready to start ventilation, or select “Back” if you wish to change the settings.
 - Select the “Functional check” menu, and the unit will begin the automatic functional check (see 8.4 “Automatic function check” on page 77).
5. When the self-test has finished and the ventilation mode has been set, connect the patient.
 6. During ventilation, make any necessary changes to the ventilation values, as described later in this section.

5.3 Navigating in menus

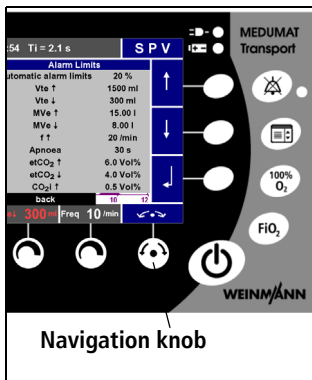
The vast majority of functions of the MEDUMAT Transport are accessed via menus. MEDUMAT Transport offers two methods of navigating in these menus:

- using the navigation knob
- using the context-dependent function buttons on the right of the display.

Menus can be closed at any time by pressing the Menu button again. If no parameters are changed, the menus close automatically after 20 seconds.

Parameter changes will not be implemented unless they are confirmed with the navigation knob or context-dependent button .

Navigating with the navigation knob

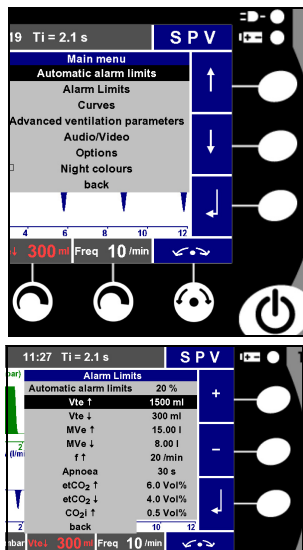


1. Select a menu using the function buttons (here: Alarm limits).
2. Select a menu item by turning the navigation knob clockwise (the selection bar moves downwards) or counterclockwise (the navigation bar moves upwards).
3. Confirm your selection by pressing the navigation knob.
4. To leave a menu, select the menu item "Back" using the navigation knob, and confirm your selection by pressing the navigation knob.

Proceed in the same way when making numeric settings (here: Alarm limits):

- Turn the navigation knob clockwise to raise the value, and counterclockwise to lower it.
 - Press the navigation knob to confirm the newly set value.
5. To switch from a sub-menu direct to the ventilation screen, press the function button for "Main menu" again.

Navigating with the context-dependent function buttons.

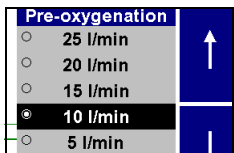


1. First, select a menu using the function buttons (here: Main menu).
2. Select a menu item by pressing the function button (the selection bar moves downwards) or the button (the navigation bar moves upwards).
3. Confirm your selection by pressing the button.
4. To leave a menu, select the menu item “Back” using the or button, and confirm your selection by pressing the .

Proceed in the same way when making numeric settings (here: Alarm limits):

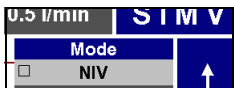
- Press the button to raise the value and the button to lower it.
 - Press the button to confirm the newly set value.
5. To switch from a sub-menu direct to the ventilation screen, press the function button for “Main menu” again.

Other symbols used in the menus:



Radio button:

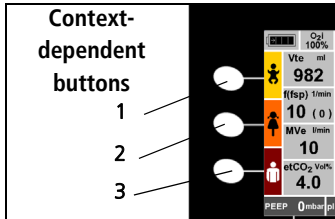
If a menu contains functions which have a so-called “radio button”, only one function at a time can be selected in this menu.



Tick box:

If a menu contains functions which have a so-called “tick box”, these functions can be activated in addition to other functions.

5.4 Emergency modes



Three modes with preset ventilation parameters are available for emergency ventilation. You can select these at any time during ventilation by pressing the context-dependent function buttons on the left of the display **twice**.

- Button 1: Infant
- Button 2: Child
- Button 3: Adult

All three emergency modes are based on the IPPV ventilation mode (see “IPPV” on page 43). This mode is activated automatically when you call up an emergency mode from another ventilation mode, e.g. SVV.

IPPV ventilation is started with preset parameters. These are optimized for the following patient groups:

- Infant (approx. 10 kg body weight)
- Child (approx. 25 kg body weight)
- Adult (approx. 75 kg body weight)

Parameter	Adult	Child	Infant
PEEP	0 mbar	0 mbar	0 mbar
p_{max}	30 mbar	25 mbar	20 mbar
I:E	1:1.7	1:1.7	1:1.7
Frequency	12/min	20/min	30/min
V_t	600 ml	200 ml	100 ml

5.5 Selecting a ventilation mode

MEDUMAT Transport offers the following ventilation modes. Details about the individual modes are given on the pages indicated below.

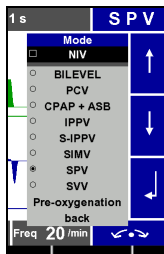
Pressure-controlled ventilation modes

- SPV (see "SPV" on page 38)
- CPAP + ASB (see "CPAP + ASB" on page 39)
- BILEVEL (see "BILEVEL" on page 40)
- PCV (see "PCV" on page 41)

Volume-controlled ventilation modes

- SVV (see "SVV" on page 42)
- IPPV (see "IPPV" on page 43)
- S-IPPV (see "S-IPPV" on page 44)
- SIMV (see "SIMV" on page 45)

To select a ventilation mode, proceed as follows:



1. First, select the "Mode" menu using the "Mode" function button.
2. Select the ventilation mode you require using the navigation knob or the context-dependent function buttons on the right of the display. If necessary, you can additionally activate the NIV function.
3. Confirm your selection by pressing the navigation knob or the corresponding context-dependent function button.

Note:

In combined ventilation modes, breaths can be triggered by the patient within a time slot of 20% (depending on the rate) or 100% (S-IPPV mode) before the mandatory breath is initiated.

NIV

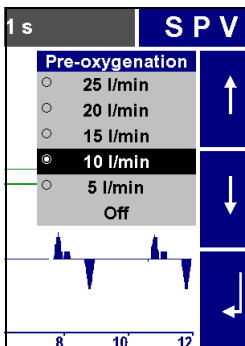
NIV: Non-Invasive Ventilation (mask ventilation)

This additional function can be activated in all the ventilation modes. The leakage alarm is deactivated. The unit uses optimised trigger points for the NIV mode.

Caution

- If the NIV function is not activated during ventilation with leakages, the unit can only be triggered by the patient by greatly increased respiratory efforts. This may endanger the success of treatment.
- In certain circumstances, the required O₂ concentration may not be achieved during ventilation with leakages. This is for technical reasons and is not a malfunction. When the NIV mode is activated, the alarm limit is therefore automatically set to 20%.

Preoxygenation



1. Call up the "Mode" menu by pressing the corresponding function button.
2. Select the "Preoxygenation" function in the "Mode" menu, and confirm your selection.
3. Select the liter capacity you require using the navigation knob, and confirm your selection.
The selected liter capacity is indicated in the blue Mode field on the screen.
4. To end preoxygenation, select "Off" and confirm your selection. The "Preoxygenation" menu is closed. The "Mode" menu is displayed.

Changing to a different ventilation mode

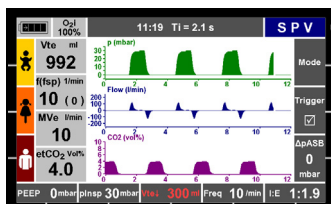
If you change from one ventilation mode to another, the unit will respond as follows:

- Ventilation parameters which are also available in the new ventilation mode are retained unchanged.
- Ventilation parameters which are not available in the new ventilation mode are saved, but have no influence on the current ventilation. The saved values become available again as soon as the previous ventilation mode is reactivated.
- When changing from volume-controlled ventilation to pressure-controlled ventilation, the inspiratory pressure is limited to 15 mbar.

5.6 Pressure-controlled ventilation modes

SPV

SPV: Smart Pressure Ventilation



SPV mode is used for pressure-controlled ventilation with fixed pressure levels.

This mode offers maximum flexibility: By selecting suitable parameters, all other ventilation modes that are integrated in MEDUMAT Transport can be implemented.

You can set the following ventilation values using the control knobs:

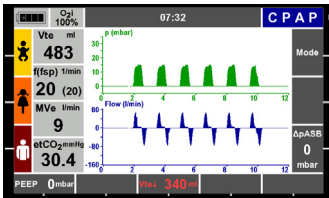
- Control knob 1: PEEP
- Control knob 2: P_{insp}
- Control knob 3: V_{te} ↓ (alarm limit)
- Control knob 4: Respiratory rate
- Navigation knob: I:E or T_i at a breathing rate < 6/min.
- You can set the following parameters using the context-dependent function buttons on the right of the display.
- Button 1: Select a different ventilation mode
- Button 2: Activate/deactivate trigger
- Button 3: Δp_{ASB}

You can find more setting options under the menu item “Advanced ventilation parameters” in the “Main menu” (see 6.4 “Setting advanced respiratory parameters” on page 63).

CPAP + ASB

CPAP: Continuous Positive Airway Pressure

ASB: Assisted Spontaneous Breathing



CPAP mode is used to increase the pressure level of respiration in order to raise the functional residual capacity (FRC).

ASB mode is used for pressure support of insufficient spontaneous respiration. The patient is able to breathe spontaneously without any restriction, but is supported in his breathing effort by the MEDUMAT Transport.

The CPAP + ASB mode is used exclusively on patients with adequate spontaneous respiration.

You can set the following ventilation values using the control knobs:

- Control knob **1**: CPAP
- Control knob **2**: No function
- Control knob **3**: $V_{te} \downarrow$ (alarm limit)
- Control knob **4**: No function
- Navigation knob: No function

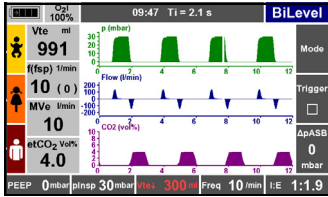
You can set the following parameters using the context-dependent function buttons on the right of the display.

- Button **1**: Select a different ventilation mode
- Button **2**: No function
- Button **3**: Δ pASB

You can find more setting options under the menu item “Advanced ventilation parameters” in the “Main menu” (see 6.4 “Setting advanced respiratory parameters” on page 63).

BILEVEL

BILEVEL: Positive airway pressure during inspiration and expiration



BiLevel mode is used for pressure-controlled ventilation combined with free spontaneous respiration during the entire breathing cycle and for adjustable pressure support at PEEP level.

This mode is used on patients who have no spontaneous respiration or on spontaneously breathing patients prior to extubation. This mode can also be used for weaning by gradually reducing the mandatory part of the total minute volume (MV) and reduction of the support pressure (ASB).

You can set the following ventilation values using the control knobs:

- Control knob **1**: PEEP
- Control knob **2**: P_{Insp}
- Control knob **3**: $V_{\text{Te}} \downarrow$ (alarm limit)
- Control knob **4**: Respiratory rate
- Navigation knob: I:E or T_i at a respiratory rate < 6/min.

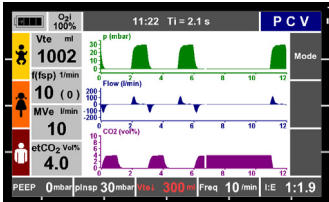
You can set the following parameters using the context-dependent function buttons on the right of the display.

- Button **1**: Select a different ventilation mode
- Button **2**: Activate/deactivate trigger
- Button **3**: Δ pASB

You can find more setting options under the menu item “Advanced ventilation parameters” in the “Main menu” (see 6.4 “Setting advanced respiratory parameters” on page 63).

PCV

PCV: Pressure Controlled Ventilation



PCV mode is used for mandatory pressure-controlled ventilation with fixed pressure levels.

This mode is used on patients who have no spontaneous respiration.

You can set the following ventilation values using the control knobs:

- Control knob 1: PEEP
- Control knob 2: P_{insp}
- Control knob 3: $V_{\text{te}} \downarrow$ (alarm limit)
- Control knob 4: Respiratory rate
- Navigation knob: I:E or T_i at a respiratory rate $< 6/\text{min}$.

You can set the following parameters using the context-dependent function buttons on the right of the display.

- Button 1: Select a different ventilation mode
- Button 2: No function
- Button 3: No function

You can find more setting options under the menu item “Advanced ventilation parameters” in the “Main menu” (see 6.4 “Setting advanced respiratory parameters” on page 63).

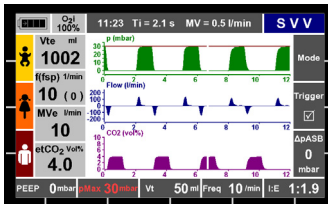
5.7 Volume-controlled ventilation modes

Caution!

In the volume-controlled modes, the ventilation pressure is limited to p_{\max} (pressure limitation). An alarm is triggered when this pressure limit is reached. It is then no longer guaranteed that the set tidal volume is actually released to the patient. In this event, check the patient's condition and, if necessary, reset the ventilation parameters.

SVV

SVV: Smart Volume Ventilation



SVV mode is used for volume-controlled ventilation with a fixed tidal volume.

This mode offers maximum flexibility: By selecting suitable parameters, all other volume-controlled ventilation modes that are integrated in MEDUMAT Transport can be implemented.

You can set the following ventilation values using the control knobs:

- Control knob 1: PEEP
- Control knob 2: p_{\max} (pressure limitation)
- Control knob 3: V_t
- Control knob 4: Respiratory rate
- Navigation knob: I:E or T_i at a respiratory rate $< 6/\text{min}$.

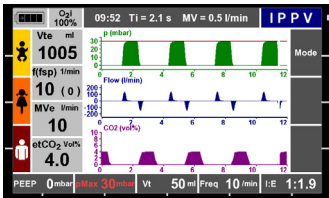
You can set the following parameters using the context-dependent function buttons on the right of the display.

- Button 1: Select a different ventilation mode
- Button 2: Activate/deactivate trigger
- Button 3: Δ pASB

You can find more setting options under the menu item "Advanced ventilation parameters" in the "Main menu" (see 6.4 "Setting advanced respiratory parameters" on page 63).

IPPV

IPPV: Intermittent Positive Pressure Ventilation



IPPV mode is used for mandatory volume-controlled ventilation with a fixed tidal volume.

This mode is used on patients who have no spontaneous respiration.

You can set the following ventilation values using the control knobs:

- Control knob **1**: PEEP
- Control knob **2**: p_{max} (pressure limitation)
- Control knob **3**: V_t
- Control knob **4**: Respiratory rate
- Navigation knob: I:E or T_i at a respiratory rate < 6/min.

You can set the following parameters using the context-dependent function buttons on the right of the display.

- Button **1**: Select a different ventilation mode
- Button **2**: No function
- Button **3**: No function

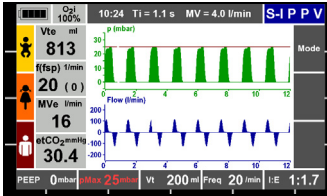
You can find more setting options under the menu item “Advanced ventilation parameters” in the “Main menu” (see 6.4 “Setting advanced respiratory parameters” on page 63).

Note

If you select a PEEP > 0 in this mode, the mode designation changes from IPPV to CPPV (**C**onstant **P**ositive **P**ressure **V**entilation).

S-IPPV

S-IPPV: Synchronized Intermittent Positive Pressure Ventilation



Warning!

- **Risk of hyperventilation!** Continuously monitor the patient's measured respiratory rate and measured minute volume in order to prevent hyperventilation.
- **Risk of air trapping!** Continuously monitor the airway pressure in order to prevent air trapping.

S-IPPV mode is used for volume-controlled ventilation with a variable mandatory minute volume (MV). Throughout the entire expiration phase, a trigger is active which enables the patient to initiate a new breath. The patient is thus able to increase the respiratory rate, and therefore the minute volume MV, and to adapt them to his/her requirement.

This mode is used on patients who have inadequate spontaneous respiration.

You can set the following ventilation values using the control knobs:

- Control knob **1**: PEEP
- Control knob **2**: p_{\max} (pressure limitation)
- Control knob **3**: V_t
- Control knob **4**: Respiratory rate
- Navigation knob: I:E or T_i at a respiratory rate $< 6/\text{min}$.

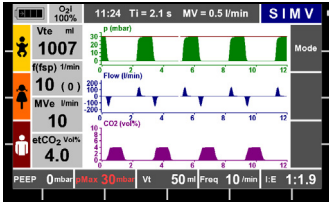
You can set the following parameters using the context-dependent function buttons on the right of the display.

- Button **1**: Select a different ventilation mode
- Button **2**: No function
- Button **3**: No function

You can find more setting options under the menu item "Advanced ventilation parameters" in the "Main menu" (see 6.4 "Setting advanced respiratory parameters" on page 63).

SIMV

SIMV: Synchronized Intermittent Mandatory Ventilation



SIMV mode is used for volume-controlled ventilation with a fixed mandatory minute volume (MV).

Between the mandatory mechanical breaths, the patient can breathe spontaneously and so increase the minute volume.

If there is spontaneous respiration, the mandatory mechanical breath is synchronized with the patient's breathing. The mandatory minute volume remains unchanged.

This mode is used on patients with inadequate spontaneous respiration or for weaning patients by gradually reducing the mandatory part of the total minute volume.

You can set the following ventilation values using the control knobs:

- Control knob 1: PEEP
- Control knob 2: p_{\max} (pressure limitation)
- Control knob 3: V_t
- Control knob 4: Respiratory rate
- Navigation knob: I:E

You can set the following parameters using the context-dependent function buttons on the right of the display.

- Button 1: Select a different ventilation mode
- Button 2: No function
- Button 3: No function

You can find more setting options under the menu item "Advanced ventilation parameters" in the "Main menu" (see 6.4 "Setting advanced respiratory parameters" on page 63).

5.8 Other ventilation functions

The ventilation functions “O₂ concentration” and “100% O₂” are available for all the ventilation modes. You can call up and set these functions at any time using the fixed-assignment function buttons on the right of the display.

Warning!



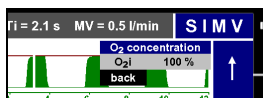
Risk of poisoning! Highly concentrated oxygen can have a toxic effect on the patient if administered for too long and depending on the patient's age. When ventilating with pure oxygen or an oxygen-air mixture, make sure that oxygen is only administered for an appropriate period.


Setting the O₂ concentration

To save oxygen, ventilation is normally carried out with an oxygen/air mixture. The administered oxygen concentration can be selected between 40% and 100%. The currently measured value is shown in the top info field on the display.

If you switch from oxygen/air mixture (**40% O₂**) to pure oxygen (**100% O₂**), the respiratory minute volume changes within the preset tolerances (see 12. “Technical Data” on page 95), at the most. To set the O₂ concentration, proceed as follows.

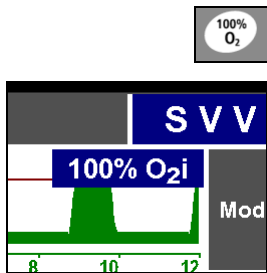
1. Call up the “O₂ concentration” menu using the FiO₂ button.



2. Select “O₂ concentration” in the menu and confirm your selection.
3. Select the required O₂ concentration using the navigation knob or the function buttons.
4. Press the  button or the navigation knob to confirm your selection.

100% O₂ function

To raise the oxygen concentration to 100% (for a maximum of two minutes), you can use the "100% O₂" function.



1. Press the "100% O₂" button to confirm the function. The message "100% O₂" appears on the display.
2. Press the "100% O₂" button again to end the function. Ventilation is continued with the originally set O₂ concentration. The function is ended automatically after two minutes.

5.9 Performing ventilation

Tube

As a rule, the patient is intubated before the tube is connected to the patient valve.

1. Set the desired ventilation mode and the associated ventilation parameters.
2. Attach the patient valve to the connector of the endotracheal tube.
3. During ventilation, check the respiratory parameters on the display. This will enable you to determine whether ventilation is adequate.

Note

If your unit is equipped with the optional CO₂ measurement, you can check the tube position on the basis of the capnogram and correct it if necessary.

Ventilation mask

1. If necessary, use the elbow supplied with the hose system to ensure optimum routing of the hose system, depending on the patient's position.

Caution

Using the elbow increases the dead space of the hose system. Take this into account when setting the ventilation parameters. Otherwise the success of treatment may be compromised.

2. Attach the mask to the hose system.
3. If necessary, introduce a Guedel oropharyngeal tube to keep the patient's airways free.
4. Place the ventilation mask over the patient's mouth and nose.
5. Extend the patient's head and, at the same time, hold the mask tight against the patient's face by means of the EC grip.

5.10 Monitoring ventilation

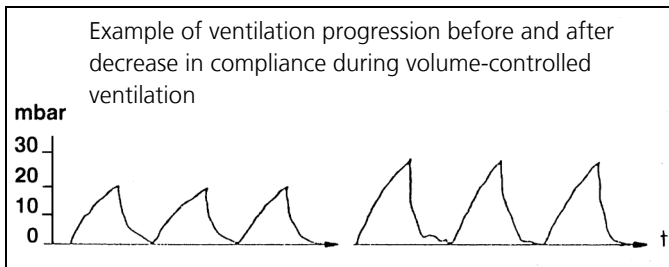
General

During ventilation, you must monitor the patient continuously. You can follow the progress of ventilation on the display. You can select various display formats.

High airway resistances, e.g., due to obstructions of the airway or during external cardiac massage, may change the respiratory minute volume, depending on the ventilation mode.

If lung compliance decreases, the unit responds as follows:

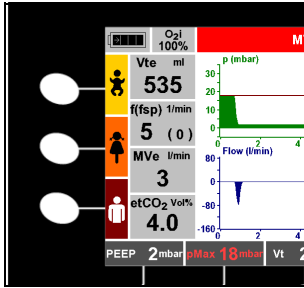
- With volume-controlled ventilation, the ventilation pressure rises until the set pressure limit is reached, while the ventilation volume remains constant. Then the applied volume drops.
- With pressure-controlled ventilation, the applied volume drops while the pressure remains constant.



Note

All the displayed measurements for flow, volume, or MV relate to ambient temperature and ambient air pressure.

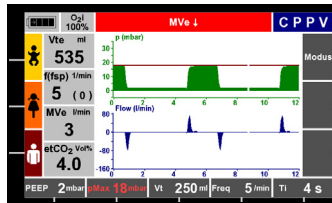
Displayed measurements



During ventilation, the following parameters are shown on the display as numbers:

- V_{te} : expiratory tidal volume
- $f(fsp)$: respiratory rate/number of spontaneous breaths per minute
- MVe : expiratory minute volume
- $etCO_2$: end-tidal CO₂ concentration (only with units equipped with optional CO₂ measurement)
- O_2i : inspiratory O₂ concentration delivered by the unit

Ventilation progress graphs

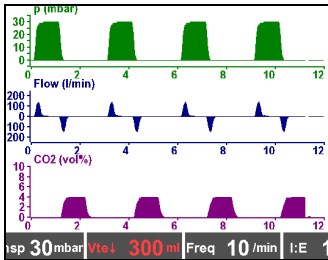


For the purpose of ventilation monitoring, the standard unit displays the following parameters:

- Ventilation pressure, flow

If you have a unit equipped with CO₂ measurement, you can display up to three graphs. The following presentation versions are possible:

- Ventilation pressure, flow
- Ventilation pressure, CO₂
- Ventilation pressure, flow, CO₂



5.11 Alarm signals

Alarm priority

MEDUMAT Transport classifies alarms in the following priority levels:

- high priority
- medium priority
- low priority

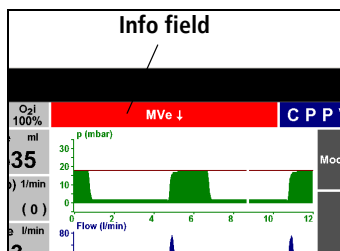
If two or more alarms occur simultaneously, alarms with the currently highest priority are displayed cyclically.

You can set limit values for alarms relating to respiratory physiology (see 6.2 “Setting alarm limits” on page 61).

Display of alarms

MEDUMAT Transport displays alarms as follows:

- High priority
 - LED flashes red
 - Audible alarm “high priority” every 8 seconds
 - Alarm text appears in info field; info field flashes red
- Medium priority
 - LED off
 - Audible alarm “medium priority” every 15 seconds
 - Alarm text appears in info field; info field flashes yellow
- Low priority
 - LED off
 - Audible alarm “low priority” every 30 seconds
 - Alarm text appears in info field; info field has turquoise background



Muting the alarm



When an alarm occurs, you can mute the audible alarm temporarily (120 seconds) by pressing the Alarm Mute button. For these 120 seconds, a yellow LED is alight. Press the button again to reactivate the acoustic alarm. The visual alarm remains active.

As soon as a higher-priority alarm occurs, the acoustic alarm is immediately reactivated.

Visual and acoustic alarms are automatically reset as soon as the cause of the alarm has been rectified.

5.12 Ventilation with filters (not supplied with the unit)

For hygiene purposes, and to condition the air for breathing, you can equip the patient valve with commercially available filters (HME, bacterial or combined HME/bacterial filters) with standard 15/22 mm connections. This increases both the inspiration and expiration resistance, so you should monitor the ventilation pressure and volume with special care.

Allowance must be made for the larger dead space, especially with children.

Always follow the filter manufacturer's operating instructions.

5.13 Ending ventilation

Caution!

Never empty the oxygen cylinder completely. Always ensure that there is a certain residual pressure in the cylinder when you return it for filling, as this prevents moist ambient air from entering and causing corrosion.

1. Check the remaining oxygen content on the contents gauge. If the contents gauge indicates 50 bar or less, the cylinder must be refilled or a reserve cylinder obtained to ensure that the unit remains ready for use.
2. Close the valve on the oxygen cylinder.



3. Hold down the On/Standby/Off button for 2 seconds to switch the unit to standby.

Note:

The unit still uses up electricity in standby mode. If the unit does not need to be used for a long time or is not connected to the power supply, we recommend switching it off. To do so, hold down the On/Standby/Off until the LED alarm goes out (approx. 10 seconds).

5.14 Calculating the oxygen level/operating time

Caution!

When calculating the oxygen level in the cylinder, take into account the unit's O₂ consumption (see 12.4 "O₂ consumption of the unit" on page 100). Otherwise you may miscalculate how long the cylinder will last, which may impair the success of treatment.

Oxygen level in the cylinder

Oxygen volume = cylinder volume x cylinder pressure.

	Cylinder volume	x Cylinder pressure	= Oxygen content
Example 1	10 l	x 200 bar	= 2000 l
Example 2	10 l	x 100 bar	= 1000 l

Available operating time for ventilation

V_t (tidal volume) x f (respiratory rate) = MV (minute volume)

$\text{Available operating time for ventilation (min)} = \frac{\text{Oxygen content (l)}}{V_t \times f + \text{O}_2 \text{ consumption}} \times \frac{100}{\text{O}_2 \text{ concentration}}$

Example 1:

O₂ supply = 1000 l; $V_t \times f = 11$ l/min; 100% O₂, O₂ consumption 0.3 l (see 12.4 "O₂ consumption of the unit" on page 100).

This gives: 3

$$\text{Available operating time for ventilation (min)} = \frac{1000 \text{ l}}{11.3 \text{ l/min}} \times \frac{100}{100\%} = 88 \text{ min} = 1 \text{ h } 28 \text{ min}$$

If MEDUMAT Transport is operated with an O₂ concentration less than 100%, the operating time will increase correspondingly.

5.15 Alternative ventilation

In the event of the MEDUMAT Transport breaking down during ventilation, you have the following alternatives:

Ventilation bag

1. Pull the patient valve off the tube or mask.
2. Attach the ventilation bag, e.g., COMBIBAG WM 11000 from WEINMANN and carry out manual ventilation.

Ventilation aid

You can use the LIFEWAY WM 10580 from WEINMANN to perform mouth-mask ventilation.

Oxygen failure

In exceptional situations, when there is no oxygen supply, the MEDUMAT Transport can also be operated with sterile compressed air.

Note

During ventilation with sterile compressed air or concentrator oxygen, the unit gives the "O₂ ↓" alarm continuously.

5.16 Changing battery during use

The battery should be changed in good time when it starts to run low. Always keep a fully charged battery ready for changeover.

Note

If you change the battery within the space of 30 seconds, the unit restarts automatically. Settings made before changing battery are then retained.

Proceed as follows:

1. Have the fully charged battery ready to hand.
2. Pull the low battery out of the unit's battery compartment.
3. Insert the replacement battery into the compartment within 30 seconds.
4. Continue with ventilation.

5.17 Battery management

MEDUMAT Transport has an internal power supply with a rechargeable battery.

Two battery versions are available:

- Battery pack Plus WM 28385 for internal and external charging; can be recharged either in the unit or using an external charger WM 28390; charge level can be checked on the battery.
- Battery pack WM 28384 for internal charging; can only be recharged in the unit; charge level can be checked on the battery.

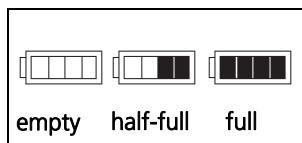
For recharging, an external DC power supply with 12 – 15 V (internal charging) or 15V (external charging) is required. Only use the vehicle/aircraft electrical power supply. If charging in an AC wall outlet, use the charger WM 28390.

MEDUMAT Transport can be operated from an external power supply when the battery is empty. The battery is charged while the unit is in operation, but charging takes longer than when the unit is off.

Caution!

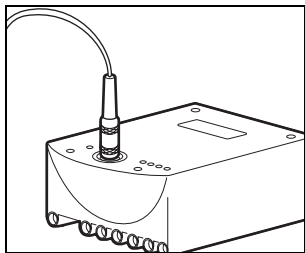
- The unit must never be operated without the battery installed because any voltage dips in the power supply cannot then be bridged, which would mean that uninterrupted ventilation of the patient is not guaranteed.
- Battery-operated medical devices have a limited operating period. MEDUMAT Transport can be operated for at least three hours without an external power supply, provided that the battery is fully charged. You should therefore ensure that the battery is always as fully charged as possible, or have a spare battery ready for use.

Battery charge level indicator (MEDUMAT Transport)



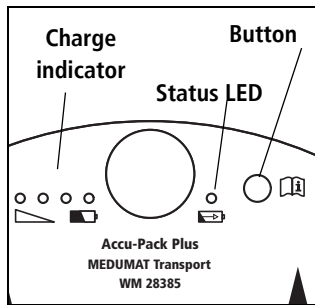
At the top left of the display you will find the symbol indicating the battery charge level. The indication is in five stages. The picture opposite shows examples of a full, half-full and empty battery.

Charge level indicaton on the battery itself



When the battery is removed from the unit, you can check the charge level on the battery itself. The state of charge is indicated by 4 green LEDs. Press the button on the battery (see drawings opposite).

Charge level indicator	Battery charge level
4 LEDs	100%
3 LEDs	75%
2 LEDs	50%
1 LED	25%
1 LED flashing	less than 10 minutes charge left



The battery's state of charge is indicated by the status LED

Status LED	Battery
LED glows green	Battery fully charged
LED flashes green	Battery is being charged
LED glows red	Battery defective. Do not use.



Charging status indicator




The charging status is only indicated when the external power supply is connected, as only then is it possible to charge the battery.

When MEDUMAT Transport is off, the charging status is shown by the charging indicator.

When MEDUMAT Transport is on, both the charging status and the battery's charge level are indicated.

Key to charging status and charge level indicators:

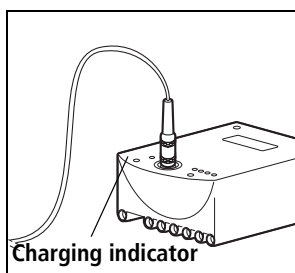
	Unit off	Unit on	
	Charging indicator	Charging indicator	Charge level indicator
Battery charging	flashes green	flashes green	 (current charge status)
Battery full	green	green	 (full)

	Unit off	Unit on	
Problem during charging	red	red	 (current charge status)
Battery is being discharged	off	off	 (current charge status)
Battery missing or defective	off	red	 (current charge status)

Charging batteries

MEDUMAT Transport starts charging the battery automatically as soon as the following conditions are met:

- External power supply with at least 12 V DC connected
- The battery is not full (<95% charge)
- Battery temperature not above 45°C or below +5°C



Note

The battery WM 28385 has its own charging interface, so it can also be charged outside the MEDUMAT Transport. Only use the charger WM 28390.

If charging cannot be started, e.g., because the battery temperature is outside the permitted range (+ 5°C - 45°C), the charging indicator glows red. It only goes out once all the conditions for starting charging are met.

While the battery is being charged, the charging indicator flashes green.

Ending battery charging

MEDUMAT Transport automatically determines the optimum point at which to end charging by measuring and evaluating the charging curve and battery temperature. As soon as charging has ended, the charging indicator glows steady green.

Interrupting battery charging

Battery charging is continuously monitored by MEDUMAT Transport.

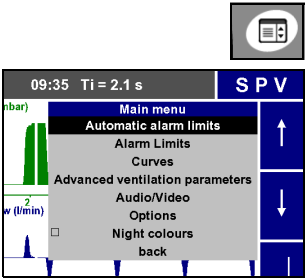
Problems which lead to charging being interrupted are:

- Battery temperature rises above 45°C, e.g., due to high ambient temperature, or falls below +5°C
- Charging current is too high (>3 A) e.g., short-circuit

If one of these problems occurs, charging is automatically interrupted and the charging indicator glows red.

Charging is also interrupted if there is no external power supply, e.g., because the unit, mounted on a portable system, has been removed from the wall mounting. The charging indicator does not light up in this case because this is not a fault, but a normal operating state. As soon as the external power is restored, e.g., when the portable system is replaced in the wall mounting, charging continues.

6. Configuring the unit



In the main menu, you can optimize the unit's settings to suit the particular service conditions. The main menu can be called up at any time using the function button for "Main menu".

To navigate in the menu, you can use either the navigation knob or the context-dependent function buttons on the right of the display (see "5.1 Controls" on page 28).

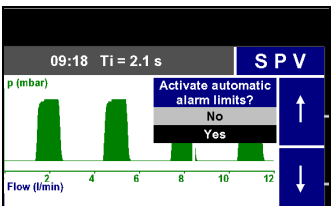
6.1 Automatic alarm limits

General

When the "Automatic alarm limits" function is active, the unit automatically sets limits for the alarms relating to respiratory physiology. The determining factor for setting the limits is the respiratory values (V_{te} , MV_e , f , and, if applicable, $etCO_2$) measured at the moment when the function is activated.

In the "Alarm limits" menu (see "6.2 Setting alarm limits" on page 61), you can set the size of deviation (in %) from the current respiratory value at which an alarm is triggered.

To activate the "Automatic alarm limits" function, proceed as follows:



1. Press the function button for "Main menu" to call up the main menu.
2. Select "Automatic alarm limits" in the menu and confirm your selection.
3. Select "Yes" in the menu and confirm your selection.

Note

The values set for "Alarm limits" (see "6.2 Setting alarm limits" on page 61) are overwritten.

Automatic alarm calculation for the Apnea alarm

The Apnea alarm is set, depending on the percentage, to 4 (10%), 5 (20%) or 6 (30%) respiratory periods. The length of a respiratory period is 60/f in seconds, i.e., with a measured respiratory rate of, for example, 15/min, the steps for the Apnea alarm limit are 16 s, 20 s, and 24 s.

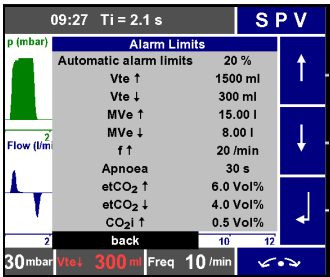
Automatic alarm for the CO_{2i} high alarm

If the Automatic alarm limits are activated, the limit for the CO_{2i} alarm is automatically set at 5 mmHG.

6.2 Setting alarm limits

You can set limit values for alarms relating to respiratory physiology. Proceed as follows:

1. Press the function button for “Main menu” to call up the main menu.
2. Select “Alarm limits” in the menu.
3. Select the alarm for which you wish to change the limit values, and confirm your selection.
4. Set the limit value and confirm your setting.
5. Repeat steps **3.** and **4.** for all the alarms whose limit values you wish to change.
6. To exit the menu, select “Back” in the menu and confirm your selection.



You can set limit values for the following alarms.

Alarm	Setting range
Auto alarm limits	10%, 20%, or 30% of the respiratory values at the time of activation
V _{te} high	55 - 3000 ml
V _{te} low	5 - 2000 ml
MV high	1 -160 l
MV low	0.1 - 110 l
f high	1 - 150/min
Apnea	4 - 60 s

Alarm	Setting range
etCO ₂ high	20 - 75 mmHg/ 2.6-9.9% by vol./ 2.6-10 hPa
et CO ₂ low	0 - 40 mmHg/ 0-9.9% by vol./0-5.4 hPa
CO ₂ i high	5 - 7 mm Hg / 0-9.9% by vol. / 0-10 hPa

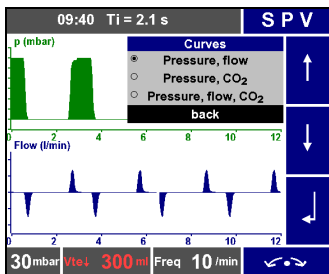
6.3 Setting the presentation of ventilation values (only with units with etCO₂ measurement)

For the purpose of ventilation monitoring, you can have up to three parameters (ventilation pressure, flow, CO₂ concentration) simultaneously, in graph form, on the display of the MEDUMAT Transport with etCO₂ measurement. The following presentation versions are possible:

- Ventilation pressure, flow
- Ventilation pressure, CO₂
- Ventilation pressure, flow, CO₂

To select a presentation version, proceed as follows:

1. Press the function button for "Main menu" to call up the main menu.
2. Select "Curves" in the menu.
3. Select the presentation version you require and confirm your selection.
4. To exit the menu, select "Back" and confirm your selection.



Note

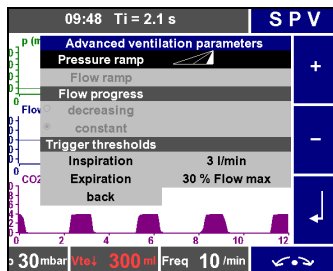
On units without etCO₂ measurement the display shows respiratory pressure and flow as graphs. No other settings are possible.

6.4 Setting advanced respiratory parameters

To achieve optimal results during transport ventilation, you can make settings in the “Advanced ventilation parameters” menu, depending on the selected mode.

The non-selectable functions in a particular ventilation mode are shown in grey letters.

Setting the pressure ramp



With this function you can set how fast the inspiratory ventilation pressure is reached. The following rise times are possible:

- Flat ramp: slow pressure rise
- Medium ramp: medium pressure rise
- Steep ramp: fast pressure rise

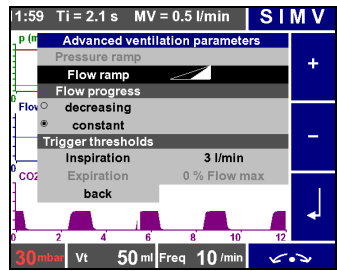
Note

How quickly the set pressure is actually reached depends on the patient, any leakage (NIV) and the ventilating parameters that have been set.

To set the pressure ramp, proceed as follows:

1. Press the function button for “Main menu” to call up the main menu.
2. Select “Advanced ventilation parameters” in the menu and confirm your selection.
3. Select “Pressure ramp” in the menu and confirm your selection.
4. Select the level (1-3) you require and confirm your selection.
5. To exit the menu, select “Back” and confirm your selection.

Setting the flow ramp



With this function you can set how fast the inspiratory flow is reached. The following rise times are possible:

- Flat ramp: slow flow rise
- Medium ramp: medium flow rise
- Steep ramp: fast flow rise

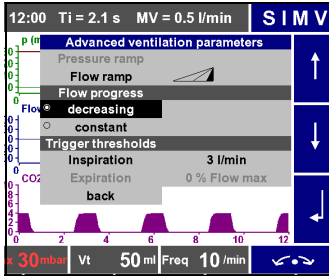
Note

How quickly the set flow is actually reached depends on the patient, any leakage (NIV) and the ventilating parameters that have been set.

To set the flow ramp, proceed as follows:

1. Press the function button for “Main menu” to call up the main menu.
2. Select “Advanced ventilation parameters” in the menu and confirm your selection.
3. Select “Flow ramp” in the menu and confirm your selection.
4. Select the level you require and confirm your selection.
5. To exit the menu, select “Back” and confirm your selection.

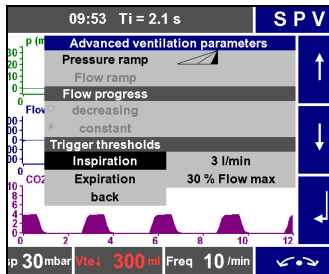
Flow progress



With this function you can set the flow progress. Proceed as follows:

1. Press the function button for "Main menu" to call up the main menu.
2. Select "Advanced ventilation parameters" in the menu and confirm your selection.
3. Select the setting you require under "Flow progress" ("constant" or "decreasing") and confirm your selection.
4. To exit the menu, select "Back" and confirm your selection.

Setting trigger thresholds



With this function you can set the inspiratory and expiratory trigger threshold. Proceed as follows:

1. Press the function button for "Main menu" to call up the main menu.
2. Select "Advanced ventilation parameters" in the menu and confirm your selection.
3. Under "Trigger thresholds", select "Inspiration" or "Expiration" and confirm your selection.
4. Set the value you require and confirm your setting.
5. To exit the menu, select "Back" and confirm your selection.

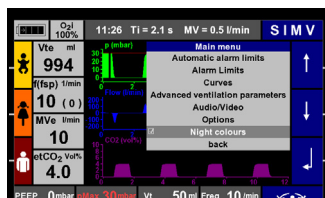
You can make the following trigger settings:



Trigger	Setting range
Inspiration	1 - 15 l/min in 1-liter steps
Expiration	5%-50% of the maximum flow in 5% steps

6.5 “Night colors” display mode

To ensure optimal legibility in night-time use, you can activate the “Night colors” display mode. In this mode, the display has a black background to prevent glare.

To activate the “Night colors” display mode, proceed as follows.

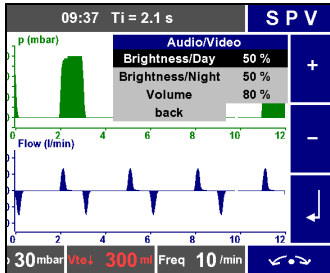


1. Press the function button for “Main menu” to call up the main menu.
2. Select “Night colors” in the menu.
3. Press the navigation knob or the  button to activate the “Night colors” display mode. To deactivate the mode, press the navigation knob or the  button again.
4. To exit the menu, select “Back” and confirm your selection.

6.6 Setting the display brightness and the volume

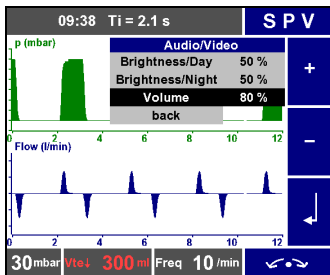
In the Audio/Video menu, you can set the display brightness separately for day and night colors. You can also set the alarm volume. Proceed as follows:

Setting the brightness



1. Press the function button for "Main menu" to call up the main menu.
2. Select "Audio/Video" in the menu and confirm your selection.
3. Select "Brightness/Day" or "Brightness/Night" and confirm your selection.
4. Select the setting you require (10% - 100%) and confirm your selection.
5. To exit the menu, select "Back" and confirm your selection.

Setting the volume

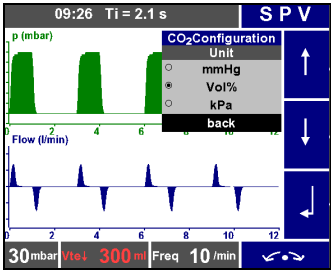


1. Press the function button for "Main menu" to call up the main menu.
2. Select "Audio/Video" in the menu and confirm your selection.
3. Under "Volume", select the setting you require (50% - 100%) and confirm your selection.
4. To exit the menu, select "Back" and confirm your selection.

6.7 Options

CO₂ configuration

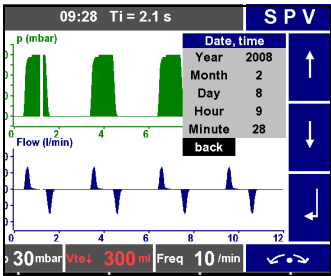
In the “CO₂ configuration” menu, you can select which unit of measurement the CO₂ concentration is displayed in. Proceed as follows:



1. Press the function button for “Main menu” to call up the main menu.
2. Select “Options” in the menu and confirm your selection.
3. Select “CO₂ configuration” and confirm your selection.
4. Select the unit you require (mmHg, % by vol., kPa) and confirm your selection.
5. To exit the menu, select “Back” and confirm your selection.

Setting the date and time

In the “Date, time” menu, you can set the current date and time. Proceed as follows:

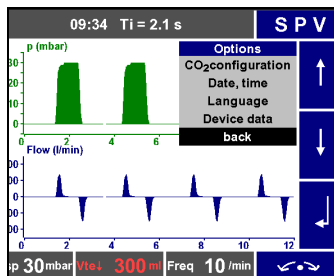


1. Press the function button for “Main menu” to call up the main menu.
2. Select “Options” in the menu and confirm your selection.
3. Select “Date, time” and confirm your selection.
4. Set the year, month, date, hour, minute, and confirm your selection.
5. To exit the menu, select “Back” and confirm your selection.

Note

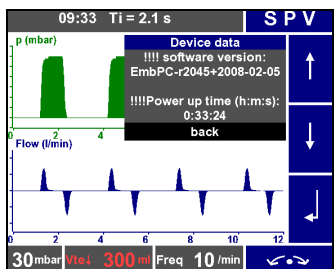
The date and time are also used for the unit's internal operations. Therefore they should both be checked regularly and corrected if necessary.

Selecting the display language



1. Press the function button for "Main menu" to call up the main menu.
2. Select "Options" in the menu and confirm your selection.
3. Select "Language" and confirm your selection.
4. Select the language you require in the "Language" menu and confirm your selection.
5. To exit the menu, select "Back" and confirm your selection.

Calling up the unit data



1. Press the function button for "Main menu" to call up the main menu.
2. Select "Options" in the menu and confirm your selection.
3. Select "Device data" and confirm your selection.
4. To exit the menu, select "Back" and confirm your selection.

7. Hygienic preparation

The MEDUMAT Transport and the accessories used must be hygienically prepared after each use. Please refer to the instructions supplied with the disinfectant used. We recommend using GIGASEPT FF for immersion disinfection and TERRALIN for wipe disinfection.

Always carry out a functional check after the hygienic preparation (see “8. Function check” on page 74).

7.1 MEDUMAT Transport

MEDUMAT Transport and the BiCheck flow sensor lead should be kept clean by simple wipe disinfection.

Please refer to the instructions supplied with the disinfectant used. We recommend using TERRALIN for wipe disinfection.

Warning!



Never immerse the MEDUMAT Transport or the BiCheck flow sensor lead in disinfectant or other liquids. Otherwise the unit may be damaged, causing a hazard to users and patients.

7.2 Hose systems

The measuring components (connector, PEEP control lead, pressure-measurement tube, CO₂ removal tube with water filter) of the reusable hose system **cannot** be reused.

For preparing the other components, follow the operating instructions supplied with the hose systems.

7.3 Parts and accessories

Masks and all silicone parts must be cleaned in a disinfectant solution:

1. All surfaces must be wetted, free of bubbles, inside and outside. Allow the disinfectant to act for the full time specified by the manufacturer.
2. After disinfection, rinse the parts **thoroughly** with distilled water to avoid residues of the disinfectant solution causing problems.
3. Leave all silicone parts to dry in the air.
4. Visually inspect the masks, and replace any damaged parts immediately.

The reusable ventilation tube, reusable patient valve (see previous section), reusable BiCheck flow sensor and ventilation masks with silicone cushion can also be autoclaved.

7.4 Fittings

Warning!



Risk of explosion! Never immerse the fittings in disinfectant or other liquids. Only carry out wipe disinfection. Liquid must not be allowed to enter the pressure reducer. Otherwise there is a risk of explosion.

If it is absolutely necessary to clean the fittings (e.g., pressure reducer, valve), use a clean cloth. The cloth may be dry or moistened with clean water.

7.5 Cleaning, disinfection and sterilization

Carry out hygienic preparation of the MEDUMAT Transport and the accessories used, as described in the following table.

Refer to the instructions supplied with the hose system and with the disinfectant used. We recommend using GIGASEPT FF for immersion disinfection and TERRALIN for wipe disinfection. You are advised to use suitable gloves for disinfection work (e.g., household or disposable gloves).

Reusable components

Parts	Cleaning	Disinfection	Thermo-disinfector	Sterilization
MEDUMAT Transport	Wipe down with a moist cloth	Wipe disinfection	Not permitted	Not permitted
BiCheck flow sensor lead	Wipe down with a moist cloth	Wipe disinfection	Not permitted	Not permitted
BiCheck flow sensor	In hot water with a mild household detergent	Immersion disinfection ⁽¹⁾	Clean at 65°C, as instructed in the disinfectant manual. Dry thoroughly	Super-heated steam sterilization at up to 134°C ⁽³⁾
Reusable patient valve	In hot water with a mild household detergent	Immerse in 6% GIGASEPT FF solution ⁽¹⁾	Washing cycle up to 95°C ⁽²⁾	Super-heated steam sterilization at up to 134°C ⁽³⁾
Reusable ventilation mask				
Reusable ventilation hose				
Reusable tube protection sleeve	Wipe down with a moist cloth	30°C washing cycle, without spinning	Possible during the washing cycle	Not permitted
Oxygen fittings	With a dry or moist cloth	Wipe disinfection	Not permitted	Not permitted

- (1) After disinfection, rinse the parts thoroughly with distilled water, and leave them to dry.
- (2) Thermal disinfection in a washer
- (3) Superheated steam sterilization at 134°C with devices which comply with EN 285; holding time up to 18 minutes.

Disposable components

Parts	Cleaning	Disinfection	Thermo-disinfector	Sterilization
Measurement hose system comprising: – PEEP control line – Pressure-measurement tube – CO ₂ removal tube – Connector – Water filter	These are disposable parts and must not be reused. Use new parts instead.			
Disposable Patient Hose System				

8. Function check

The user must carry out a function check on the unit before each use and after each disassembly, but at least every 6 months.

- Connect the ventilation hose, the patient valve, and a test bag to the MEDUMAT Transport.

Warning!



If this function check reveals any faults or discrepancies compared to the specified values, you must not use the MEDUMAT Transport. Have the unit repaired by WEINMANN or an authorized dealer.

You should first try to rectify the fault with the aid of the information provided in Section “9. Troubleshooting” on page 80. If this is not possible, have the unit repaired by the manufacturer, WEINMANN, or by a technician expressly authorized by WEINMANN.

A full function check comprises:

- Visual inspection for mechanical damage
- Visual inspection of the display
- “8.2 Checking the system for leaks” on page 75
- “8.3 Checking the patient valve (only reusable hose system)” on page 77
- “8.4 Automatic function check” on page 77
- We recommend you to always keep the following spare parts available:
 - Spare seals for the unit connections
 - A replacement dust filter
 - PEEP control diaphragm for patient valve
 - Check valve diaphragm for patient valve
 - Measurement hose system, including water filter, for CO₂ measurement

Note

Make sure that the test bag has been serviced in accordance with the maintenance schedule.

8.1 Intervals

Before each use:

- Perform a function check.

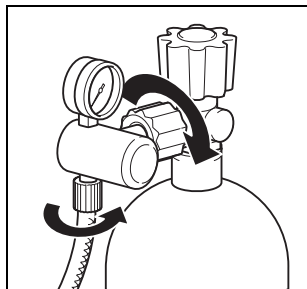
After each use or disassembly:

- Clean, disinfect and sterilize the unit (see "7. Hygienic preparation" on page 70)
- Perform a function check

At least every 6 months:

- Perform a function check.
- Check the suction filter for soiling. Unscrew and remove the filter cover. Never reinstall used filters.

8.2 Checking the system for leaks



1. **Slowly** open the valve on the oxygen cylinder. You can now read the cylinder pressure on the contents gauge of the pressure reducer. For example, a reading of 200 bar means that the cylinder is full, a reading of 100 bar that it is half full.

You should change the cylinder in good time, e.g. when the pressure falls below 50 bar, to ensure a sufficiently long operating time.

2. Close the cylinder valve again.
3. Observe the needle of the contents gauge on the pressure reducer for approx. 1 minute. If the position of the needle stays constant, the system is free from leaks. If the needle falls steadily, there is a leak in the system.

Rectifying leaks

Note

Always keep a stock of replacement seals for the connections.

1. Prepare a soapy solution using unperfumed soap.
2. Wet all the screw and hose connections with the solution. If bubbles form, this indicates a leak.
3. Release the pressure in the system:
Close the oxygen cylinder valve. Switch MEDUMAT Transport on briefly until the contents gauge on the O₂ cylinder indicates "0". Then switch MEDUMAT Transport off again.

Caution!

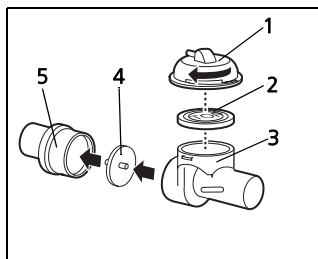
The screwed unions of the oxygen lines must only be tightened by hand.

4. If there is a leak, change the defective parts.
5. Then check for leaks again.
6. If the leak cannot be rectified, the unit must be repaired.

8.3 Checking the patient valve (only reusable hose system)

Caution!

- Also observe the “Functional control” section in the instruction manual of the “Patient Hose System” WM 66696.
- Never use torn, wavy, distorted or sticky diaphragms for ventilation. Otherwise considerable malfunctions are to be expected.
- When assembling the patient valve, it is essential to make sure that the diaphragm is correctly positioned and the right way up (the letters TOP on the PEEP control diaphragm must face upwards). Otherwise the patient valve may malfunction, putting the patient at risk.



1. Pull all the tubes and cables off the patient valve.
2. Dismantle the patient valve.
 - 1 Control cover
 - 2 PEEP control diaphragm
 - 3 Main body of the patient valve
 - 4 Check valve diaphragm
 - 5 Holder for the check valve diaphragm

3. Visually inspect all parts for cracks or other mechanical damage.
4. Change any diaphragms that are torn, wavy, distorted or sticky.
5. Reassemble the patient valve.

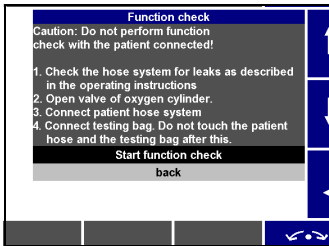
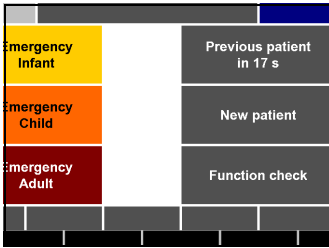
8.4 Automatic function check

MEDUMAT Transport has an automatic function check feature for testing the unit's sensors, actuators and controls. To start the automatic function check, proceed as follows.

Start automatic function check

1. First, assemble MEDUMAT Transport ready for operation with Patient Hose System.

2. Switch the unit on.
3. Check that, during the self-test, the alarm LED lights up briefly.
4. Check that, during the self-test, the alarm buzzer emits a series of five audible sounds and that the loudspeaker then emits two audible sounds.
5. Select the "Function check" item on the start screen
6. Follow the instructions on the display.



- Check for leaks (see "8.2 Checking the system for leaks" on page 75) and check the hose system (see "8.3 Checking the patient valve (only reusable hose system)" on page 77)
- Open the valve of the oxygen cylinder
- Connect the patient hose system
- Connect a testing bag. Do not touch the patient's hose and the testing bag after this

Note:

If a fault in the unit occurs during the function check, inspect the hose system and the testing bag. Switch the unit off and then on again. Repeat the function check.

If the fault reoccurs, have the unit repaired by WEINMANN or an authorized dealer.

Testing the sensors and actuators

1. Start the function check by selecting "Function check" in the menu.

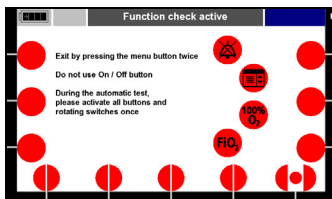
The automatic function check now runs. This takes approximately one minute. The unit tests the sensors and actuators. While this is happening, you can start testing the controls (see "Testing the controls" on page 79).

Do not touch/move the test bag or Patient Hose System. The test bag is filled and emptied according to a specific pattern during testing, so if it is touched or moved, the results of the function check could be falsified.

Note

This check ensures that physiological alarms are correctly triggered in the event of a malfunction during patient ventilation.


Testing the controls

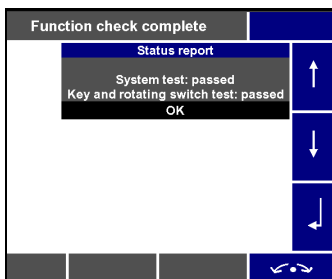


While the sensors/actuators are being tested, the function buttons and control knobs are shown in red on the display. To check that these controls function correctly, proceed as follows.

1. Press each of the controls on the unit (Do not press the controls on the screen), as described in section "5. Operation" in this manual.

A control is functioning **correctly** if the corresponding control on the screen is shown in **green**.

If a control is found to have a **defect**, the corresponding control on the display is shown in **red**. In this case, discontinue the test by pressing the menu button .



Note

Do not press the On/Standby/Off button during the test.

If all the fields are green, a summary is automatically generated and displayed as soon as the automatic function check has ended.

2. Confirm the summary with "OK". The window is closed.
3. If **defects** are found in one or more controls (corresponding fields on the screen are shown in red), discontinue the test.

Testing the power-failure alarm

1. Once the automatic function check has finished, switch to ventilation mode
2. Pull out the battery and disconnect the charger or remove the portable system from the wall mounting (for not more than 30 seconds).

If the red alarm LED flashes and an acoustic signal sounds, the power failure alarm is functional.

3. Reconnect the power supply
4. If you wish to use the unit, switch it on again.

9. Troubleshooting

If problems occur which cannot be rectified immediately, contact the manufacturer, WEINMANN, or your authorized dealer to have the unit repaired. Do not continue using the unit to avoid serious damage.

9.1 Troubleshooting

Fault	Cause	Remedy
MEDUMAT Transport cannot be switched on	MEDUMAT Transport defective	Repair by manufacturer/dealer.
	Battery empty	Recharge battery
Unusually high oxygen consumption	Leak in the oxygen feed line	Locate and rectify leaks (8.2, page 75)
MEDUMAT Transport cannot be switched off	Operating errors	Hold down button for at least 2 seconds.
Charging indicator glows red when status button is pressed.	Short-circuit	Rectify short-circuit and wait one minute, then press the status button again.
	Battery defective	Use replacement battery and have defective battery repaired
	Battery temperature outside the permitted range (permitted range for charging: 5°C - 45°C)	Charge battery within permitted temperature range: Move battery to cooler or warmer ambient temperature, as appropriate.
Battery does not respond when status button is pressed.	Battery has run down completely and has shut down to prevent exhaustive discharge	Recharge battery
Unit running time with battery operation too short	Battery has reached end of its service life	Use a new battery.

9.2 Physiologic alarms

Message	Alarm	Cause	Rectification
$V_{te} \uparrow$	V_{te} high high priority	Upper limit value exceeded	Check state of patient. Check the limit value settings for plausibility.
$V_{te} \downarrow$	V_{te} low high priority	Lower limit value not reached	Check state of patient. Check the limit value settings for plausibility.
$MV_e \uparrow$	MV_e high high priority	Upper limit value exceeded	Check state of patient. Check the limit value settings for plausibility.
$MV_e \downarrow$	MV_e low high priority	Lower limit value not reached	Check state of patient. Check the limit value settings for plausibility.
AF \uparrow	Hyperventilation medium priority	Limit value exceeded	Check state of patient. Check the limit value settings for plausibility.
Apnea	Apnea high priority	Limit value exceeded	Check state of patient. Check the limit value settings for plausibility.
Patient-side leak	Leak high priority	V_{te} less than 60% V_{ti}	Check hose system and tube; with mask ventilation, activate NIV mode.
$etCO_2 \uparrow$	$etCO_2$ high high priority	Upper limit value exceeded	Check state of patient. Check the limit value settings for plausibility.
$etCO_2 \downarrow$	$etCO_2$ low high priority	Lower limit value not reached	Check state of patient. Check the limit value settings for plausibility.
$CO_{2i} \uparrow$	CO_{2i} high high priority	Upper limit value exceeded	Check the patient valve. Check the calibration of the CO_2 module.
$O_2 \uparrow$	medium priority	Insufficient ambient air in the respiratory gas	Check parameter setting Change suction filter
$O_2 \downarrow$	high priority	Insufficient O_2 supply	Use medical O_2 supply
		Leak when NIV option is deactivated	Activate NIV option, thereby limiting FiO_2 to 20%.

Message	Alarm	Cause	Rectification
Airway pressure ↓	high priority	Lower limit value not reached	Check state of patient.
		Patient hose leaking/slipped off	Replace patient hose/attach it correctly
		Tube wrongly positioned	Check position of tube and correct if necessary.
		Hoses kinked	Check position of hoses and correct if necessary.
Airway pressure ↑	high priority	Upper limit value exceeded	Check state of patient.
		Airway obstruction	Check state of patient.
		Tube wrongly positioned	Position tube correctly
		Pmax set too low	Correct Pmax
		Hoses kinked	Check position of hoses and correct if necessary.

9.3 System alarms

Message	Alarm	Cause	Rectification
CO ₂ occlusion	medium priority	Suction filter or removal hose blocked	Change suction filter on measurement hose system or replace complete measurement hose system
CO ₂ module defective	low priority	CO ₂ module defective, no communication or no plausible data	Continue ventilation without CO ₂ measurement; have unit repaired as quickly as possible.
CO ₂ temperature range not reached	CO ₂ module not ready for operation low priority	Temperature in the unit below 0°C	Continue ventilation without CO ₂ measurement
Flow not achievable	low priority	Implausible settings (respiratory rate, tidal volume I:E) Gas supply inadequate	Provide adequate gas supply, adjust ventilation parameters

Message	Alarm	Cause	Rectification
Check BiCheck flow sensor	medium priority	BiCheck flow sensor defective or disconnected	Connect BiCheck flow sensor or use fully functional flow sensor.
		BiCheck flow sensor connection line defective or disconnected	Connect BiCheck flow sensor connection line correctly or use fully functional sensor lead.
Flow module defective	medium priority	BiCheck module defective	Have unit repaired
Input pressure < 2.7 bar	high priority	Compressed gas source not switched on/oxygen cylinder almost empty	Switch on compressed gas source or use full oxygen cylinder.
		Compressed gas source not correctly connected	Check connection and feed lines of compressed gas source.
		Compressed gas source defective	Replace compressed gas source
		Compressed gas tube kinked or squashed	Route compressed gas tube so that it is not kinked or squashed.
		Pressure reducer defective	Replace pressure reducer
Input pressure > 6 bar	high priority	Pressure of respiratory gas too high	Use 6 bar compressed gas source < or switch unit off and disconnect.
Battery operation	low priority	External power supply too weak or has failed	No unit fault; message appears, e.g., on removing unit from wall mounting or portable system or if a power failure occurs during operation via the power supply unit (alarm stops automatically after 10 seconds).
No battery or battery defective	medium priority	No battery inserted	Insert battery in unit.
		Battery defective	Replace battery.
Battery almost empty	A further 10 minutes operation is possible, medium priority	Low battery	Use replacement battery.
Fault when unit is started	high priority	Unit defective	Have unit repaired
Fault during cylinder/battery change when patient is connected	high priority	Fault during the automatic function check	Disconnect the patient, restart the unit, repeat the function check.

Message	Alarm	Cause	Rectification
Unit temperture too low	Unit too cold high priority	Unit's internal temperature < -20°C Unit switches off after 10 minutes if it is not warmed up to above -20°C within this time	Move unit to a warmer environment.
Unit temperature high	low priority	Unit's internal temperature > 65°C	Move unit to a cooler environment. If necessary, switch unit off to accelerate cooling.
Unit temperature critical	high priority	Unit temperature > +75°C Unit switches off after 10 minutes, or if its internal temperature rises above 82°C	Move unit to a cooler environment. If necessary, switch unit off to accelerate cooling.

10. Maintenance

10.1 MEDUMAT Transport

Note:

Remember to always have a safety check carried out after maintenance and repair work.

MEDUMAT Transport must be serviced at regular intervals.

We recommend that maintenance work such as inspections and repairs should be carried out by the manufacturer, WEINMANN, or by a technician expressly authorized by WEINMANN.

Every 6 months

- Change the suction filter (see "10.4 Changing the suction filter" on page 87)

Every 2 years:

Every 2 years, you must have the cleaned and disinfected ventilator and the cleaned and disinfected reusable hose system subjected to a **safety check** in accordance with §6 Medical Device Operator Ordinance (MPBetreibV) (only in the Federal Republic of Germany) in conjunction with servicing by the manufacturer or by a technician expressly authorized by the manufacturer

- Check that the equipment is complete;
- Visual inspection:
 - mechanical damage
 - labeling of the controls
 - all external hoses to check for damage
- Check the batteries
- Change wearing parts: e.g., dust filter
- Check system components: portable system, oxygen fittings, hose connections, etc.
- Check the test bag
- Final inspection according to Inspection and Test Instruction WM 28590

Every 4 years:

- Servicing of the oxygen fittings (e.g., pressure reducer) by the manufacturer or by a technician expressly authorized by the manufacturer.
- Change wearing parts: filter screens

Every 6 years:

- Change wearing parts in the unit, button cell and wearing parts in the valve seals

Every 10 years:

- Repeat testing of the conventional steel oxygen cylinders by the TÜV (Technical Inspectorate). The next testing date is shown on the shoulder of the cylinder.

Every 12 years:

- Change the circuit boards

10.2 Batteries

The batteries used for MEDUMAT Transport are maintenance-free. Nevertheless, it is advisable to fully charge them at regular intervals (every 6-12 months, depending on the length of use) and then fully discharge them again.

This so-called "learning cycle" calibrates the batteries' internal capacity calculation and so ensures the greatest possible accuracy of charge indication. After the learning cycle, charge the battery fully again so that it is ready for use.

Note

The batteries used for MEDUMAT Transport do not have a "memory effect". Therefore you can recharge them when they are only partially discharged without reducing their capacity or life. But even these batteries naturally have a limited life of approx. two years or approx. 300 charging cycles.

10.3 Accessories

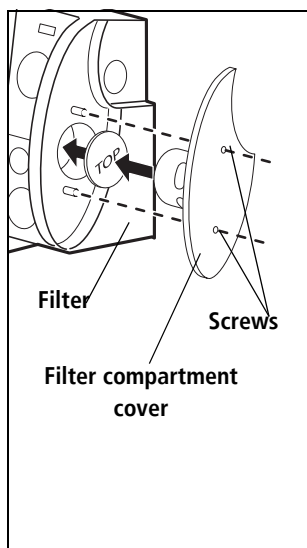
Separate maintenance intervals and maintenance volumes apply for the accessories to MEDUMAT Transport. Please observe the respective instructions for use.

Oxygen cylinders must be re-examined on a regular basis. The due date can be found on the corresponding label on the cylinder.

10.4 Changing the suction filter

Caution!

Never operate the unit without the suction filter. Otherwise the unit's functions may be impaired or the unit may be damaged.



1. Undo the two screws in the filter compartment cover (hexagon socket head screws, 3 mm) and remove the cover.

Note

Support the cover on one side with a slot-head screwdriver. This prevents the cover from jamming while you are lifting it off.

2. Remove the old filter with tweezers.
3. Clean the area of the air inlet and outlet openings with a cotton bud (moistened with Terralin).

Caution!

Do not use compressed air for cleaning the area of the air inlet and outlet openings, as this may blow dust particles into the unit. This can cause malfunctions, thereby putting the patient at risk.

4. Wipe disinfect the filter compartment cover with Terralin and let it dry.
5. Install the new suction filter with tweezers so that the letters "top" remain visible when the filter is in place.
6. Refit the cover and screw tight.

10.5 Storage

If MEDUMAT Transport is not going to be used for a considerable length of time, we recommend the following procedure:

1. Clean and disinfect the unit (see "7. Hygienic preparation" on page 70).
2. Switch the unit off by pressing the On/Standby/Off button (approx. 10 seconds) until the alarm LED goes out completely.
3. Store MEDUMAT Transport in a dry place (see "12. Technical Data" on page 95).

Caution!

Be sure to observe the maintenance intervals even when the unit is in storage, as otherwise it must not be used when removed from storage.

Note

If the unit is going to be stored for longer than a month, remove the battery and store separately. To keep the battery ready for use, charge it every six months.

10.6 Disposal

Ventilator



Do not dispose of the unit in the household waste. Consult an authorized electronic waste recycling company for the proper disposal of the unit. You can find out their address from your environmental officer or from your local council.

Disposal of batteries



Do not dispose of used batteries in the household waste. Contact WEINMANN or a public waste disposal authority.

11. Product, accessories

11.1 Standard scope of supply

MEDUMAT Transport

WM 28300

Parts	Order number
MEDUMAT Transport basic unit	WM 28315
Reusable patient hose system, complete	WM 28425
Battery	WM 28384
Set of vibration absorbers for unit installation	WM 15730
Ventilation mask size 5 for adults	WM 5074
Set of CPAP/NIV disposable masks with air cushion – 1 x CPAP/NIV disposable mask in each of the sizes S, M, L with retaining ring for headgear – 1 x headgear	WM 15807
Set for unit inspection of MEDUMAT Transport	WM 15737
Set of suction filters	WM 15473
Form for STK (safety check) certificate (Germany only)	WM 28325
Delivery record	WM 16318
Medical device book	WM 16212
Instruction manual MEDUMAT Transport	WM 66001
Concise operating instructions	WM 66016

MEDUMAT Transport with CO₂ module

WM 28400

Parts	Order number
MEDUMAT Transport basic unit with CO ₂ module	WM 28415
Other items supplied as with MEDUMAT Transport WM 28300	

11.2 Accessories

Parts	Order number
Oxygen cylinder, 2-liter	WM 1822
Lightweight aluminium oxygen cylinder, 2-liter	WM 1821
Pressure reducer OXYWAY Fix III 120 l/min; 4.5 bar	WM 30301
Pressure reducer OXYWAY Fast II High Flow 190 l/min; 4.5 bar	WM 31891
Water trap	WM 28360
Pressure hose, 10 bar, with connection nozzle G 3/8; at the other end, the option of a union nut G 3/8 or oxygen supply connector	Article number on request
Pressure hose, fabric, 3000 mm LG	WM 13260
Vibration absorber	WM 15730
Externally chargeable battery	WM 28385
Power supply unit	WM 28390
Set, holding plate for equipment rail	WM 15845
Set, wall holder for power supply unit and charger	WM 15846
Wall holder for rechargeable battery pack	WM 15847
Hospital standard rail attachment set (1 x WM 8244)	WM 15795
Rail bracket attachment set	WM 15806
12 V supply lead	WM 28356
Ventilation mask, transparent, with inflatable silicone cushion:	
– Adults - Size 5	WM 5074
– Children and teenagers - Size 3	WM 5082
– Babies and infants - Size 1	WM 5086
Ventilation mask, one-piece, silicone	
– Size 5	WM 5084
– Size 4	WM 5085
– Size 2	WM 5092
– Size 1	WM 5091
– Size 0	WM 5090

Parts	Order number
Rendell-Baker ventilation mask, silicone:	
– Children - Size 3	WM 5063
– Children - Size 2	WM 5062
– Infants - Size 1	WM 5061
– Babies - Size 0	WM 5060
CPAP/NIV reusable mask, silicone	
– Children - Size S	WM 20713
– Adult - Size M	WM 20714
– Large adult- Size L	WM 20715
Set of ventilation masks, silicone	
– 1 x CPAP/NIV reusable mask in each of the sizes S, M, L	WM 15808
– 1 x headgear	
– 1 x retaining ring for headgear	
Retaining ring for headgear for CPAP/NIV reusable masks	WM 20701
Oropharyngeal tube:	
– Adults - Size 3	WM 3165
– Teenagers - Size 2	WM 3163
– Children - Size 1	WM 3162
Reusable patient hose system, 3 m, complete	WM 28676
Disposable hose system, 3 m, with CO ₂ measurement, without BiCheck flow sensor	WM 28688
Disposable hose system, 3 m, without CO ₂ measurement, without BiCheck flow sensor	WM 28691
Measurement hose system, 3 m, without CO ₂ measurement, packaged	WM 28693
Set of disposable hose systems, 3 m, with CO ₂ measurement, without BiCheck flow sensor (10 x WM 28690)	WM 15851
CO ₂ measurement, without BiCheck flow sensor (10 x WM 28690)	WM 15852
Set of measurement hose systems, 3 m, with CO ₂ measurement (10 x WM 28595)	WM 15853

Parts	Order number
Set of measurement hose systems, 3 m, without CO ₂ measurement (10 x WM 28685)	WM 15854
Disposable hose system, without CO ₂ measurement, with BiCheck flow sensor	WM 28657
Disposable hose system, with CO ₂ measurement, with BiCheck flow sensor	WM 28483
Measurement hose system, without CO ₂ measurement, without BiCheck flow sensor	WM 28685
Set of disposable hose systems, with CO ₂ measurement, without BiCheck flow sensor (10 x WM 28690)	WM 15837
Set of disposable hose systems, with CO ₂ measurement, without BiCheck flow sensor (25 x WM 28690)	WM 15838
Set of disposable hose systems, with CO ₂ measurement, without BiCheck flow sensor (50 x WM 28690)	WM 15839
Set of disposable hose systems, without CO ₂ measurement, without BiCheck flow sensor (10 x WM 28695)	WM 15840
Set of disposable hose systems, without CO ₂ measurement, without BiCheck flow sensor (25 x WM 28695)	WM 15841
Set of disposable hose systems, without CO ₂ measurement, without BiCheck flow sensor (50 x WM 28695)	WM 15842
Set of disposable components, without CO ₂ measurement (10 x WM 28657)	WM 15754
Set of disposable components, without CO ₂ measurement (25 x WM 28657)	WM 15755
Set of disposable components, without CO ₂ measurement (50 x WM 28657)	WM 15756
Set of measurement hose systems, without CO ₂ measurement (10 x WM 28685)	WM 15751

Parts	Order number
Set of measurement hose systems, without CO ₂ measurement (25 x WM 28685)	WM 15752
Set of measurement hose systems, without CO ₂ measurement (50 x WM 28685)	WM 15753
Set of disposable components, with CO ₂ measurement, with BiCheck flow sensor (10 x WM 28483)	WM 15766
Set of disposable components, with CO ₂ measurement, with BiCheck flow sensor (25 x WM 28483)	WM 15767
Set of disposable components, with CO ₂ measurement, with BiCheck flow sensor (50 x WM 28483)	WM 15768

11.3 Replacement parts

Parts	Order number
Seal for pressure hose	WM 1145/31
Ventilation mask, size 5, for adults	WM 5074
Set of CPAP/NIV disposable masks with air cushion – 1 x CPAP/NIV disposable mask in each of the sizes S, M, L with retaining ring for headgear – 1 x headgear	WM 15807
Rechargeable battery	WM 28384
Reusable patient hose system, complete	WM 28425
Disposable patient hose system, complete	WM 28435
Set of disposable components, preconnected for disposable patient hose system (10 pcs)	WM 15766
Set of disposable components, preconnected for disposable patient hose system (25 pcs)	WM 15767
Set of disposable components, preconnected for disposable patient hose system (50 pcs)	WM 15768

Parts	Order number
Disposable measurement hose system	WM 28595
Disposable measurement hose system (10 pcs)	WM 15771
Disposable measurement hose system (25 pcs)	WM 15772
Disposable measurement hose system (50 pcs)	WM 15773
Water filter (5 pcs)	WM 97011
Protection sleeve for ventilation hose	WM 28585
Set of suction filters (5 x WM 28331)	WM 15473
BiCheck flow sensor (5 pcs)	WM 15685
Test bag for Medumat with triggering	WM 1454
CPAP/NIV disposable masks – Children - Size S, with retaining ring for headgear – Adult - Size M, with retaining ring for headgear – Large adult - Size L, with retaining ring for headgear	WM 20703 WM 20704 WM 20705
Set of 25 CPAP/NIV disposable masks for children, size S, with retaining ring for headgear	WM 15831
Set of 25 CPAP/NIV disposable masks for adults, size M, with retaining ring for headgear	WM 15832
Set of 25 CPAP/NIV disposable masks for large adults, size L, with retaining ring for headgear	WM 15833
Set of 50 CPAP/NIV disposable masks for children, size S, with retaining ring for headgear	WM 15834
Set of 50 CPAP/NIV disposable masks for adults, size M, with retaining ring for headgear	WM 15835
Set of 50 CPAP/NIV disposable masks for large adults, size L, with retaining ring for headgear	WM 15836
Headgear for CPAP/NIV masks	WM 20702

12. Technical Data

12.1 Specifications

	MEDUMAT Transport
Product class according to 93/42/EEC	IIb
Dimensions WxHxD	345 x 163 x 149 mm
Weight	approx. 4.4 kg; (approx. 4.6 kg with etCO ₂ measurement)
Operation: – Temperature range – Humidity – Air pressure	<p>-18°C to 50°C Battery charging +5°C to +45°C 15% to 95% non-condensing 54 kPa to 110 kPa (Note: If the unit is operated outside the specified pressure range, the measurement tolerances and unit tolerances will be exceeded.</p>
Storage: – Temperature range – Humidity	<p>-30°C to 70°C 0% to 95% non-condensing</p>
Power supply	12 V - 15 V DC
Max. current consumption	$I_{\min} = 0.5 \text{ A}$; $I_{\max} = 3.5 \text{ A}$
Classification acc. to EN 60601-1 – Type of protection against elec. shock – Degree of protection against elec. shock – Degree of protection against water	<p>Protection class II Type BF IP X4</p>
Electromagnetic compatibility (EMC) as per EN 60601-1-2 – Radio interference suppression – Radio interference immunity	<p>EN 55011, RTCA DO-160E EN61000-4 Parts 2 to 6 and 11, RTCA-DO160E</p>
Standards satisfied	EN60601-1, EN794-3, DIN ISO 10651-3, EN 1789, RTCA DO-160E

	MEDUMAT Transport
Display	7" TFT color display Resolution: 800 x 480 pixels Brightness: 350 cd/m ²
Control	Time- and trigger-operated, pressure-controlled or volume-controlled
Ventilation modes – Volume-controlled: – Pressure-controlled:	SVV, SIMV, IPPV, S-IPPV SPV, PCV, BiLevel, CPAP + ASB
Preoxygenation	5 -25 l/min in 5-liter steps Tolerance of preoxygenation flow: ± 2 l/min or 20%
Operating gases	Medical oxygen
Operating pressure range	2.7 to 6.0 bar
Required gas supply Recommended gas supply: – dyn. supply pressure – drawn flow Non-recommended supply: – dyn. supply pressure – drawn flow	at least 2.1 bar at least 80 l/min less than 2.1 bar less than 80 l/min
Maximum outlet flow	At least 150 l/min at a dynamic supply pressure of 4.5 bar and <u>addition of ambient air</u> . With volume-controlled ventilation, the outlet flow is limited to 100 l/min.
Respiratory time ratio	Adjustable between 4:1 and 1:4
Respiratory rate	3 - 60/min
Inspiration time:	min. 0.2 s (200 ms) max. 59 s
Tidal volume	50 - 2000 ml
Ventilation pressure	3 - 60 mbar (With pressure-controlled ventilation modes: pressure control via proportional valve) With volume-controlled ventilation modes: pressure limitation to p_{\max}
Pressure support (Δp_{ASB})	0 - 30 mbar
Mechanical safety valve	Pressure limitation to 100 mbar max.
PEEP	0 - 30 mbar (pressure control via proportional valve)
Trigger	Flow trigger, recording of the flow value via internal flow sensor

	MEDUMAT Transport
Trigger sensitivity with assisted ventilation (flow trigger) – Inspiration trigger – Expiration trigger	1 - 15 l/min 5% - 50% of the inspiratory maximal flow
Tolerances for respiratory time ratio	$\pm 5\%$
Tolerances for ventilation rate	$\pm 1/\text{min}^{-1}$
Tolerances for tidal volume	$\pm 20 \text{ ml}$ or $\pm 15\%$
Tolerances for ventilation pressure	$\pm 3 \text{ mbar}$ or $\pm 10\%$
Tolerances for flow measurement (monitoring)	$\pm 15\%$
Tolerances for volume measurement (monitoring)	$\pm 15\%$
CO ₂ measurement	Side-stream method, removal rate 75 ml/min
Tolerances for CO ₂ measurement	0.43% by vol. + 8% of the CO ₂ concentration as per EN 21647:2004
O ₂ measurement	Non-consuming O ₂ sensor
O ₂ concentration	Adjustable in 10% steps between 40% and 100%
Tolerances O ₂ measurement	$\pm 10\%$ by vol.
Compressed gas thread	External thread G 3/8 Quick-release coupling, available for various types
Ventilation hose connection	WEINMANN-specific
Patient valve connections	WEINMANN-specific
Internal power supply	Maintenance-free, removable Li-ion battery, Expected life 2 years, capacity: 6.45 Ah, operating time with battery: 4.5 h, charging time: 4h
Internal buffer battery	Button cell CR 3220, expected life: at least 6 years
Sound pressure level of alarm	45 - 80 dB (A)

	MEDUMAT Transport
Ventilation hose – Reusable system – Disposable system	PVC hose; service life at least 30 cleaning, disinfection or sterilization cycles PVC hose; one-time use
Resistance of Patient Hose System (as per EN 794-3 and DIN ISO 10651-3): – Inspiration – Expiration – Spontaneous respiration	< 6 mbar at 60 l/min (BTPS) Flow resistance at 15, 30 and 60 l/min; pressure drop < 1.5 / <3.0 and <6.0 mbar
Dead space – Reusable patient valve – Disposable patient valve	29 ml (with elbow: 41 ml) 25 ml (with elbow: 34 ml)
Compliance – Reusable hose system – Disposable hose system	0.79 ml/hPa (ml/cmH ₂ O) 0.90 ml/hPa (ml/cmH ₂ O)
Internal volume of the complete respiratory system: – Reusable hose system – Disposable hose system	approx. 586 ml approx. 586 ml

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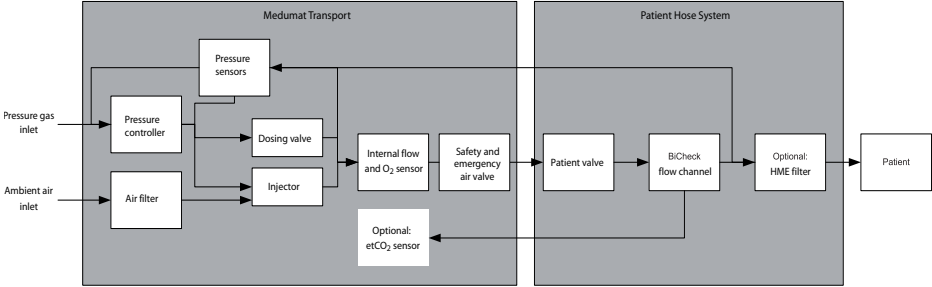
Subject to alterations in design.

All the measurements (flow, volumes, minute volume) relate to ambient temperature and ambient air pressure, unless stated otherwise.

1bar = 100kPa

This unit's software contains code which is subject to the GPL. You will receive the source code and the GPL upon request.

12.2 Block diagram



12.3 Separation distances

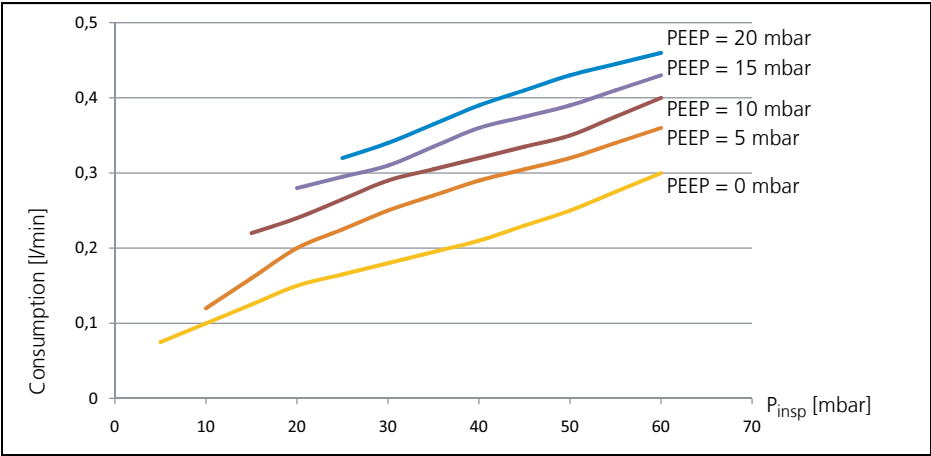
Recommended separation distances between portable and mobile RF telecommunication devices (e.g., cellular phone) and MEDUMAT Transport

The MEDUMAT Transport is intended for use in an electromagnetic environment in which the RF interference is controlled. The customer or user of the MEDUMAT Transport can help to avoid electromagnetic interference by observing the minimum distance between portable and mobile RF telecommunication devices (transmitters) and the MEDUMAT Transport, as recommended below, according to the transmitter's power output.

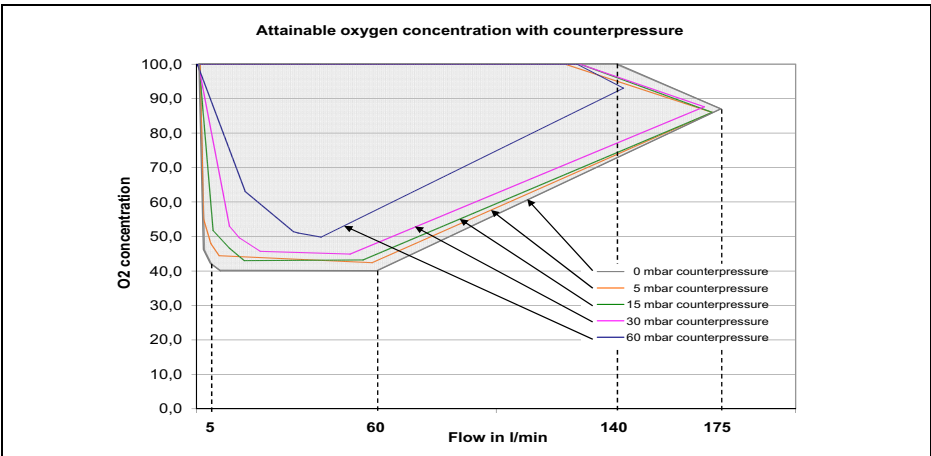
Nominal power of the RF device in W	Separation distance according to transmission frequency in m		
	150 kHz - 80 MHz	80 MHz - 800 MHz	800 MHz – 2.5 GHz
0.01	0.04	0.04	0.07
0.1	0.11	0.11	0.22
1	0.35	0.35	0.70
10	1.11	1.11	2.21
100	3.50	3.50	7.00

Further technical data are available on request from WEINMANN and are also provided in the service and repair manual. Subject to alterations in design.

12.4 O₂ consumption of the unit



12.5 Possible O₂ concentration with counterpressure



12.6 Attainable tidal volume with counterpressure

With volume-controlled ventilation, the volume released to the patient is influenced by the hose compliance. In relation to the respective airway pressure, the tidal volume falls by 0.79 ml/mbar (reusable hose system) or by 0.9 ml/mbar (disposable hose system).

Counterpressure (mbar)	Deviation of tidal volume (ml)	
	Reusable hose system	Disposable hose system
0	0	0
5	-3.95	-4.5
15	-11.85	-13.5
30	-23.7	-27
60	-47.4	-54

The stated values refer to the standard hose systems (Reusable hose system WM 28425 and Disposable hose system WM 28435). If you have a different hose system (e.g., of a different length), refer to the instruction manual for the Patient Hose System WM 66696 for the values that apply to your system.

13. Warranty

- WEINMANN warrants that the product, when used for the intended purpose, will remain free from defects for a period of two years from the date of purchase. For products whose service life is indicated as less than two years, the warranty shall end on the expiration date indicated on the packaging or in the instruction manual.
- Warranty claims must be accompanied by the sales receipt, showing the seller and date of purchase.
- We offer no warranty in the case of:
 - Disregard of the instruction manual
 - Operating errors
 - Improper use or handling
 - Repairs to the unit by non-authorized persons
 - Acts of God, e.g., lightning strikes.
 - Transport damage as a result of improper packaging of returned items
 - Lack of maintenance
 - Operational and normal wear and tear, which includes the following components:
 - filters
 - batteries (incl. rechargeable)
 - articles for one-time use
 - Failure to use original spare parts.
- WEINMANN is not liable for consequential damage caused by a defect unless it is based on intent or gross negligence. WEINMANN is also not liable for injury to life or limb resulting from slight negligence.
- WEINMANN reserves the right, at its option, to rectify defects, deliver a defect-free item or reduce the purchase price by a reasonable amount.
- If WEINMANN rejects a warranty claim, it shall not bear the expense of transport between customer and manufacturer.
- This warranty does not affect your statutory rights.

14. Declaration of Conformity

WEINMANN Geräte für Medizin GmbH + Co. KG declares herewith that the product complies fully with the respective regulations of the Medical Device Directive 93/42/EEC. The unabridged text of the Declaration of Conformity can be found on our website at www.weinmann.de

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