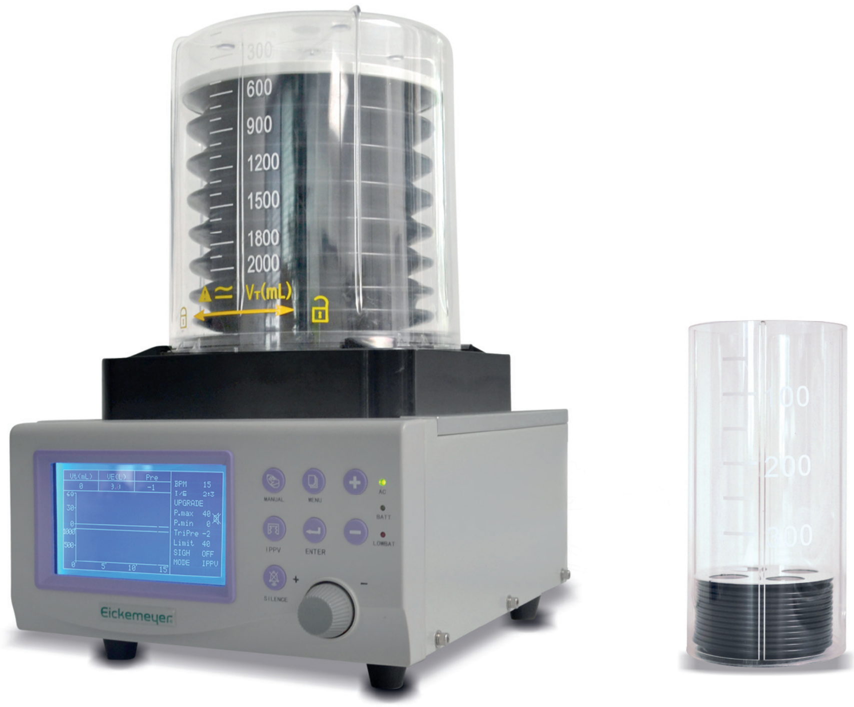
EICKEMEYER®
DIGITAL VENTILATOR

MANUAL



Art. No. 213016

Content

1 Preface

Thank you for purchasing an EICKEMEYER® product. Please read this manual carefully before the use of this machine so that to guarantee the safety and reliability when using.
This manual contains in detail the major performance and technical regulations of the EICKEMEYER® Ventilator, as well as the responsibility that the user and EICKEMEYER® should undertake.

1.1 Attention Items

- The EICKEMEYER® Ventilator has to be operated by professional anaesthesiologists, and work together with an anaesthetic breathing system in accordance with ISO 8835-2, and an anaesthetic gas scavenging transfer and receiving system in accordance with ISO 8835-3.

- The user has to read carefully the manual for the EICKEMEYER® Ventilator before using it and follow closely the application procedure provided in this manual.

- The safety requirements about clinical usage have been well considered in designing the EICKEMEYER® Ventilator, but the user has to observe the status of the machine and nurse the patient.

- For the connection of the EICKEMEYER® Ventilator to an anaesthetic system and gas scavenging transfer and receiving system, see the last clause for details.

- Because this machine does not use Ethyl and Cyclopropane etc. as flammable anaesthetic agent, there is no need for antistatic respiratory pipelines or face masks.

- When using high frequency electrical surgical equipment, antistatic or conductive respiratory pipelines will likely burn, so it is not suggested to use that unit.

- The measured value of this system is achieved under STPD (standard temperature pressure dry).

- The foldable airbag and the reusable parts with contact to patients must be sterilized or disinfected before using them on a new patient.

- When using this system, wasted gas will arouse, there is an exhaust port beside the bellows. Connect the exhaust port to outdoor so as to avoid room pollution.

- When the anaesthetic gas delivery system stops delivering gas, medical gas pipelines pressure is ≤0.3 kPa.

- Central supply gas system malfunction will possibly lead to one or more units that work together with it stop working at same time.

- Each time before using this system, please check the air tightness, soda lime performance, ventilator, sterilization etc.

- It is the responsibility of the user to provide the in-service condition to EICKEMEYER®.

- Disposal parts should be dealt according to relative regulations of local environment protection, in order to minimize the pollution risk.

1.2 Responsibilities of Manufacturer

EICKEMEYER® provides for clients the qualified ventilator according to standard ISO 8835-5 (Inhalation anesthetic system – Part 5: Anaesthetic Ventilator) of (Medical electrical equipment – Part 2: Particular requirements for the safety and essential performance of anaesthestic systems) which is published by the State Food and Drug Administration in July 25, 2007. EICKEMEYER® should guarantee the maintenance service of the EICKEMEYER® Ventilator within the warranty period according to the requirements in contract.

Warning:

Please only use EICKEMEYER® original equipment parts for repair or replacement.

1.3 Meaning of Symbols in this Manual or System

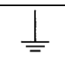
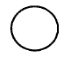
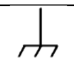
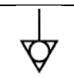
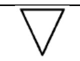
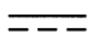
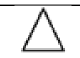
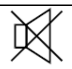
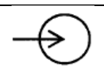
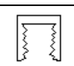
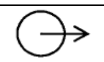
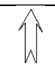
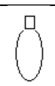
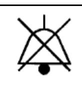
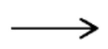
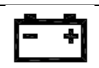
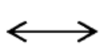
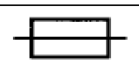
Warning and cautions means possible accidents will arouse if operation does not meet this manual. Please strictly follow this manual.

"Warning" means it may harm the operator or patient.

"Cautions" means it may damage equipment.

"Note" means additional information or suggestions etc.

Other symbols are including as below:

	ON (power)		Earthing
	OFF (power)		Frame Grounding
	STANDBY		Protective Earthing
	STANDBY for some Parts		Equal Voltage
	Increase		Decreasing
	DC Current		Increasing
	AC Current		B Type Machine
	Alarm Silence		BF Type Machine
	Note, Refer to Manual		CF Type Machine
	Input		Machine Control
	Output		Inspiration Flow
	Serial Number		Expiration Flow
	Manual Airbag		Audio Alarm Silenced
	Single Way Movement		Rechargeable Battery
	Both Way Movement		Fuse
	OPEN		LOCK
	Production Date		Manufacturer, Address

2 Construction and Operating Principle

2.1 Main Components

The EICKEMEYER® Ventilator is a respiratory management system used at general full anesthetic operation. It mainly consists of power, a gas supply, bellows, a control panel, a CPU board, a frame etc. see figure 1.

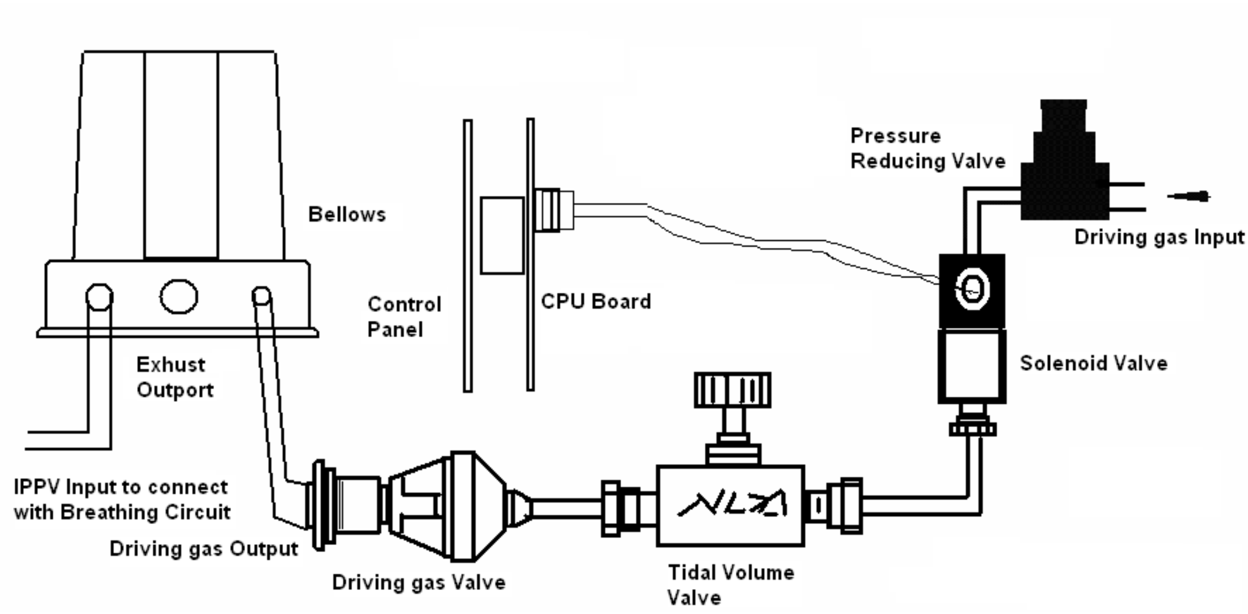


Figure 1

2.2 Electrical Controlled Parts

The electrical controlled parts include: Power, CPU Board, Control Panel, Flow Sensor, etc. Among them, the CPU Board could be used to monitor Tidal Volume, Minute Ventilation, and to set parameters – Respiratory Frequency, I:E, Tidal Volume upper / lower limit alarm, Minute Ventilation upper / lower limit alarm. The respiration pattern can be: machine control and manual breathing pattern.

2.3 Bellows

In inspiration status, driving gas will enter the bellows and foldable airbag, and drive the airbag down. At the same time, the PEEP valve and driving gas work together make the exhaust port keep close status, so as to let gas flow to bellows output port, and enter into patient lung.

In expiration status, driving gas will stop working, the patient will exhale the gas inside the lung and make it enter into the foldable airbag. When pressure within airbag exceeds the limited value, PEEP valve will automatically open, one part of gas will flow to exhaust port, while when pressure is lower than limited value, PEEP valve will automatically close.

The peak pressure protection valve will keep the airway pressure not exceed limited value 6 kPa.

2.4 Gas Supply Pipelines

The driving gas (oxygen, air etc.) enters into the ventilator through the driving gas input, after pressure reducing (4 bar), it enters into the supply gas source (there is a pressure limiting device in this gas supply unit), then the solenoid valve, tidal volume valve, driving gas valve etc. Finally it reaches the driving gas output, and cooperated with solenoid valve and tidal volume valve, produces the respiratory process.

3 Usage

The ventilator is a newly developed portable unit, suitable for respiratory management of full anaesthetic condition. Light, small, movable, and suitable for patients with more than 5 kg. Min. tidal volume can be controlled at about 100 ml. It can work together with an anaesthetic system and perform tightly closed, semi tightly closed and open respiratory management.

4 Assembly of Parts

Take up the bellows and push the bottom along with the channel, refer to figure 2.

Figure 2

Fix the bellows with 2 pieces M4 x 8 bolts, refer to figure 3.

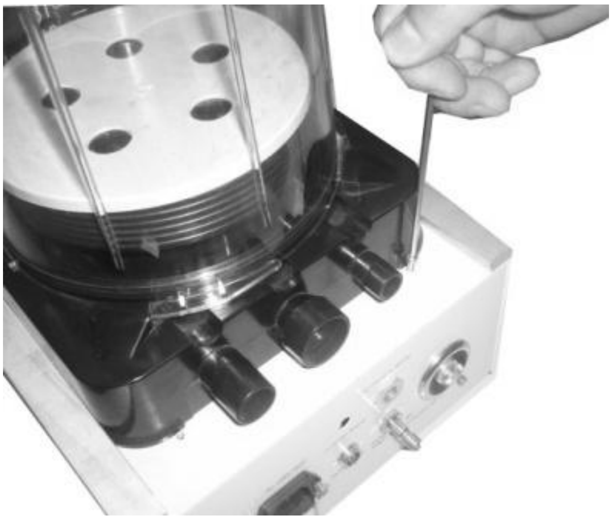


Figure 3

5 Operation

5.1 Installation of Main Unit

5.1.1 Connecting with Portable Anesthesia Machine

Please well prepare the soft tubes, corrugated pipelines, and flow sensor. Refer to table 1 and figure 4–12 for pipeline connections.

Connecting Ends	Gas Supply	Ventilator	Bellows	Anesthesia Machine	Reference Pictures
Driving Gas Supply Pipelines	Driving Gas	Driving Gas Input			Figure 4 Figure 8
Flow Sensor		Flow Sensor Connector		Respiratory Connector	Figure 5 Figure 12
Corrugated Soft Tube (Φ22X900)		Connecting with Breathing Circuit		Manual Airbag Connector	Figure 6 Figure 11
Corrugated Soft Tube (Φ15X300)		Driving Gas Outlet	Driving Gas Inlet of Bellows		Figure 7 Figure 9
Pressure Sampling Pipe-lines (PU Tube 4x6)		Pressure Sampling Connector		Airway Pressure Sampling Connector	Figure 10

Table 1

Figure 4

Figure 5

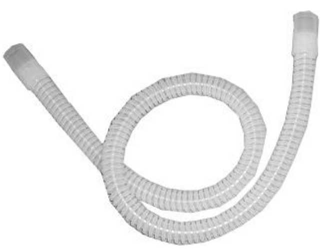


Figure 6

Figure 7

Figure 8

Figure 9

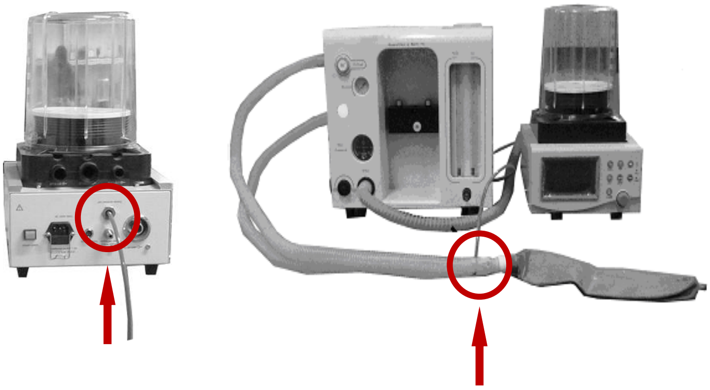


Figure 10

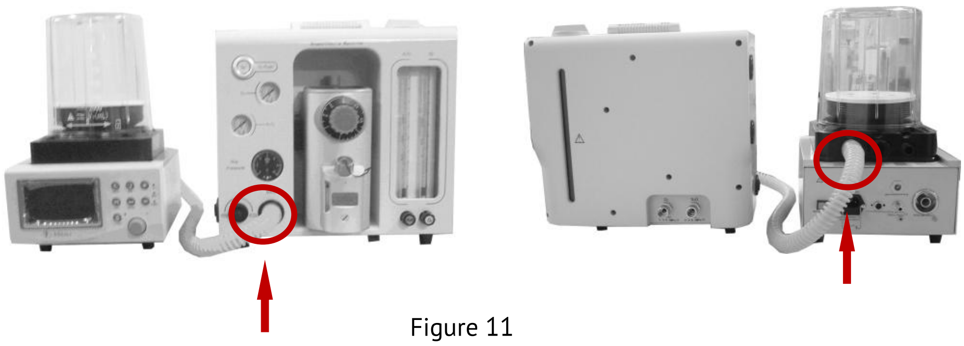


Figure 11

Figure 12

5.1.2 Connecting with Anesthesia Machine Aries 2700

Fix the tray on the block of the frame with 4 pieces M6 x 9 bolts, refer to figure 13.

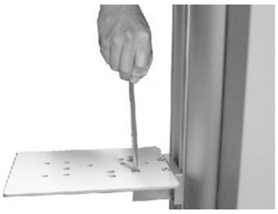


Figure 13

Put the ventilator on the support plate, and fix the ventilator with a M8 x 35 bolt, refer to figure 14 and figure 15.

Figure 14

Figure 15

Please well prepare the soft tubes, corrugated pipelines, and flow sensor. Refer to table 2 and figure 16–24 for pipeline connections.

Connecting Ends	Gas Supply	Ventilator	Bellows	Anaesthesia Machine/ Breathing Circuit	Reference Pictures
Driving Gas Supply Pipelines	Driving Gas	Driving Gas Input			Figure 16 Figure 20
Flow Sensor		Flow Sensor Connector		Respiratory Connector	Figure 17 Figure 24
Corrugated Soft Tube (Φ22x900)		Connecting with Breathing Circuit		Breathing Circuit Machine Controlled Gas Inlet	Figure 18 Figure 22
Corrugated Soft Tube (Φ15x300)		Driving Gas Outlet	Driving Gas Inlet of Bellows		Figure 19 Figure 21
Pressure Sampling Pipelines (PU Tube 4x6)		Pressure Sampling Connector		Airway Pressure Sampling Connector	Figure 23

Table 2

Figure 16

Figure 17

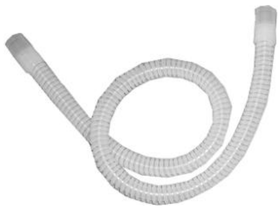


Figure 18

Figure 19

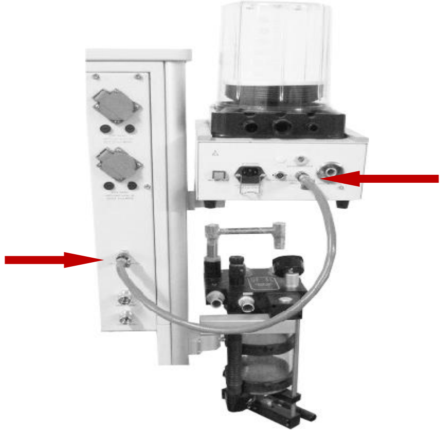


Figure 20

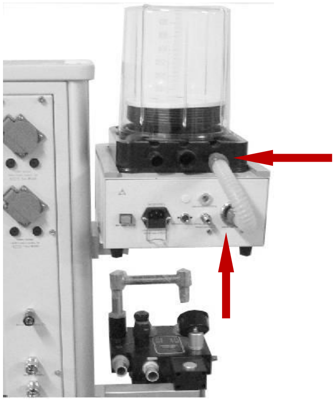


Figure 21

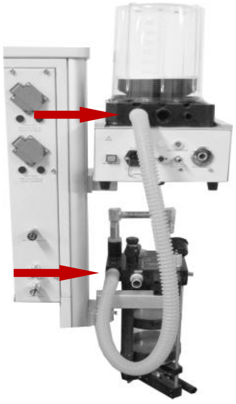


Figure 22

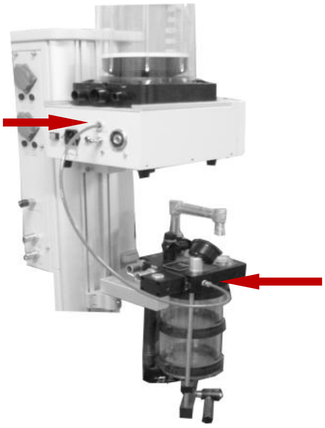


Figure 23

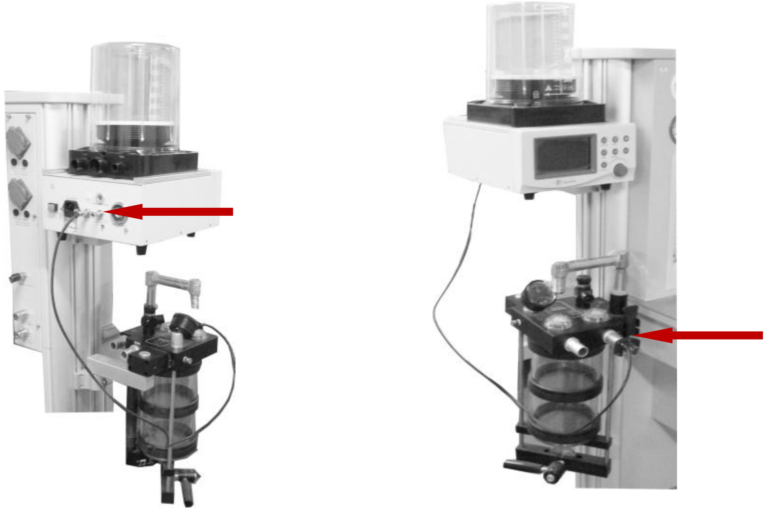


Figure 24

5.1.3 Connecting with EICKEMEYER® NarkoVet

Please well prepare the soft tubes, corrugated pipelines, and flow sensor. Refer to table 3 and figure 25−33 for pipeline connections.

Connecting Ends	**Gas Supply**	**Ventilator**	**Bellows**	**Anaesthesia Machine/ Breathing Circuit**	**Reference Pictures**
Driving Gas Supply Pipelines	Driving Gas	Driving Gas Input			Figure 25 Figure 29
Flow Sensor		Flow Sensor Connector		Respiratory Connector	Figure 26 Figure 30
Corrugated Soft Tube (Φ22x900)		Connecting with Breathing Circuit		Breathing Circuit Machine Controlled Gas Inlet	Figure 27 Figure 32
Corrugated Soft Tube (Φ15x300)		Driving Gas Outlet	Driving Gas Inlet of Bellows		Figure 28 Figure 31
Pressure Sampling Pipelines (PU Tube 4x6)		Pressure Sampling Connector		Airway Pressure Sampling Connector	Figure 33

Table 3

Figure 25

Figure 26

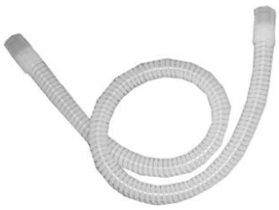


Figure 27

Figure 28

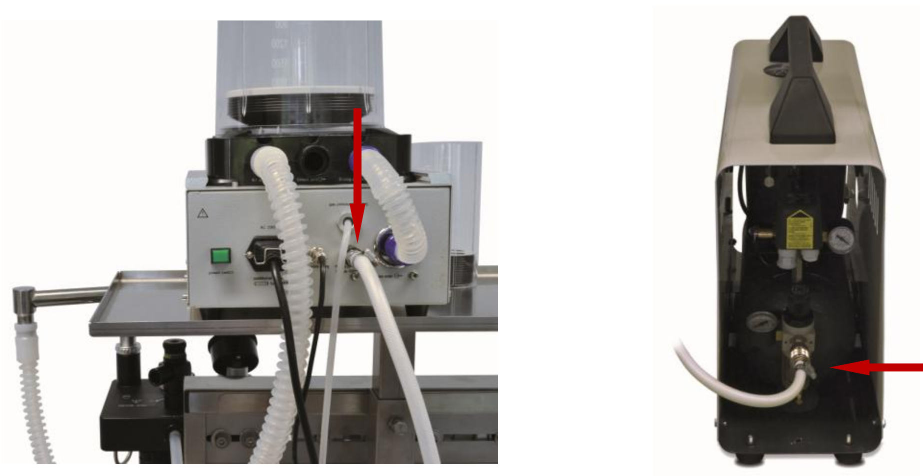


Figure 29

Figure 30

Figure 31

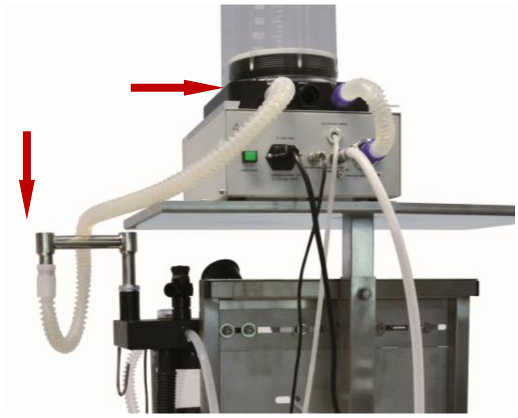


Figure 32

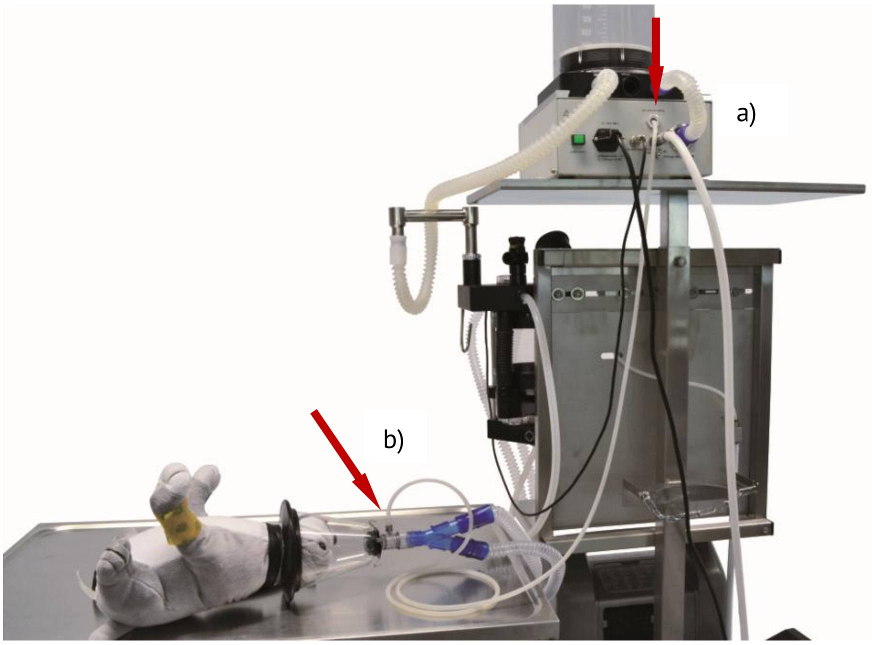


Figure 33

5.1.4 Provided Accessory

Please make sure, that the following accessories have been delivered together with your EICKEMEYER® Digital Ventilator. Otherwise the machine cannot be put into operation (see figure 34).

Luer Lock Adapter
(see fig. 33 b))

Connection to Compressor
(see fig. 29 on the right)

Figure 34

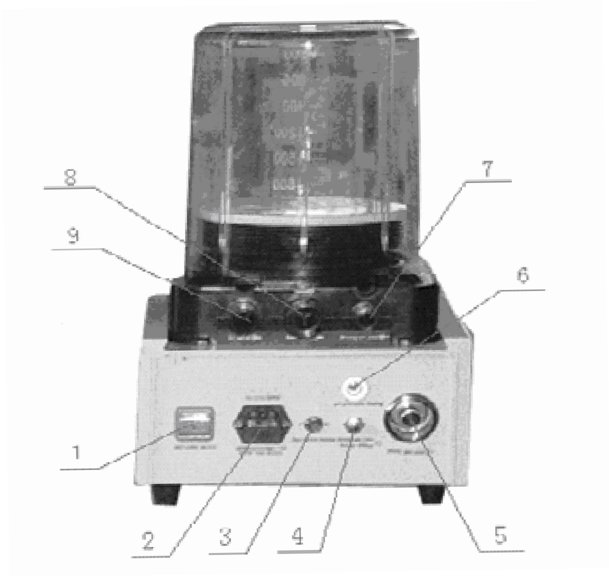
If those two adapters have not been delivered with the ventilator, please contact the EICKEMEYER® customer service.

5.2 Ventilator Front View

Please make yourself familiar with the parts and functions before use.

1 Ventilator: There are 4 bases under it and 2 fixing holes, which will be used to fix the ventilator with the trolley.
2 Bellows: It can exactly control the tidal volume, so as to adjust PEEP because mechanical ventilation mode instead of manual.
3 Control Panel: Key part of the ventilator, the monitor parameter and alarm parameter could be set on it. Also there is indication light and display.
4 Bellows Base: One key part of the ventilator, compounding with PEEP valve, peak pressure protection valve etc. inside it.
5 Foothold: 4 cushions support the ventilator.

5.3 Ventilator Back View



1 Power: Turn electricity on / off

2 Socket: Ventilator electricity supply, one wire will be connected with DC, one small device will be used to fix the wire and ventilator, so as to prevent the wire drop off from ventilator.

3 Flow Sensor Connector: The flow sensor will be connected with CPU board with this connector, then pass the signals to CPU, the figure will be shown on display.

4 Driving gas input: Connect gas supply (central supply, oxygen cylinder, air compressor etc.) with this port through hose, or connect driving gas output of anesthesia machine gas delivery system with this port through hose.

5 Driving gas output: The ventilator will change gas supply to driving gas to drive bellows, then connect with bellows driving gas input, and finish respiratory process.

6 Pressure sampling interface: The pressure sampling interface connects the pressure sampling port of the anesthesia machine respiratory circuit through an inner diameter Φ6 mm of hose. Acquisition pressure signal transmitted to the pressure sensor.

7 Bellows driving gas input: Connect with ventilator driving gas output, provide driving gas for bellows.

8 Exhaust port: Wasted gas will be drained out through this port. This port could be connected with the purified device or other pipelines to drain the wasted gas outside operation room.

9 Connect with breathing circuit: The ventilator will be connected with IPPV connector of breathing circuit of anesthesia machine, then finish machine controlled respiratory management.

Note:

If connect this port with a portable anesthesia machine, then this port could be connected with an IPPV connector directly. The IPPV input of the portable anesthesia machine and manual airbag connector is the same one.

5.4 Bellows

5.4.1 Bellows

1 Bellows Cover: There is a tidal volume scale line on the bellows. Rotate the cover clockwise to lock tightly, and counterclockwise to open the cover.

2 Foldable Bag: The descended portion each time is the tidal volume of patient at each breath. The tidal volume can be read by observing the bellows scale. You can also observe the obstruction of airway and the leakage of breathing circuit, such as you should check out if there is air leakage in breathing circuit if it descends too fast or is incapable of ascending. When changing the airbag, you have to take the airbag down with your hand, refer to figure 35.

Figure 35

3 Connector for Breathing Circuit: Connect 1 piece corrugated pipeline with the manual airbag connector, outside diameter: 22 mm.

Figure 36

4 Exhaust Port: Drains out the wasted gas to outside room, outside diameter: 30 mm.
5 Driving Gas Inlet of Bellows: By this port, connect 1 piece corrugated pipeline with driving gas outlet at the back of anesthesia machine, outside 15 mm, refer to figure 37.

Figure 37

Figure 38

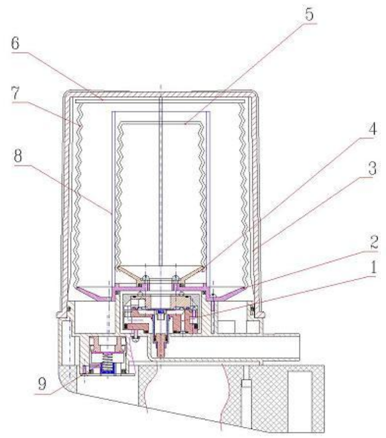
Figure 39

Foldable Bag for Animals under 5 kg: The descended portion each time is the tidal volume of patient at each breath. The tidal volume can be read by observing the bellows scale. The bellows scale can be used base reference value, and compare it with the monitored figure on the display, the base reference figure and monitored figure should be basically same. You can also observe the obstruction of airway and the leakage of breathing circuit, such as you should check out if there is air leakage in breathing circuit if it descends too fast or is incapable of ascending. When changing the airbag, you need to take it down with your hand, refer to figure 38.

Bellows Cover for Animals under 5 kg: There is a tidal volume scale line on it. The range is 0–300 ml. Pull the cover vertically with two hands, refer to figure 39.

Note:
The big foldable bag could work together with the big cover, the small bag with the small cover. When using the big foldable bag and the big cover, the small bag and the small cover have to be off. When using the small foldable bag and cover, the figure is based on what is displayed on small cover.

5.4.2 Bellows Principle and Construction



1 Various PEEP Valve
2 Foldable Airbag Base for animals over 5 kg
3 Bellows Cover
4 Foldable Airbag Base for animals under 5 kg
5 Foldable Airbag for animals under 5 kg
6 Foldable Airbag Cover for animals over 5 kg
7 Foldable Airbag for animals over 5 kg
8 Foldable Airbag Cover for animals under 5 kg
9 Peak Pressure Protection Valve

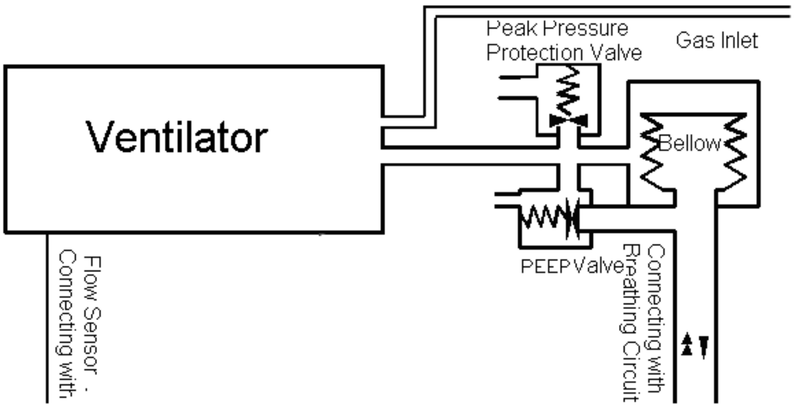


Figure 40

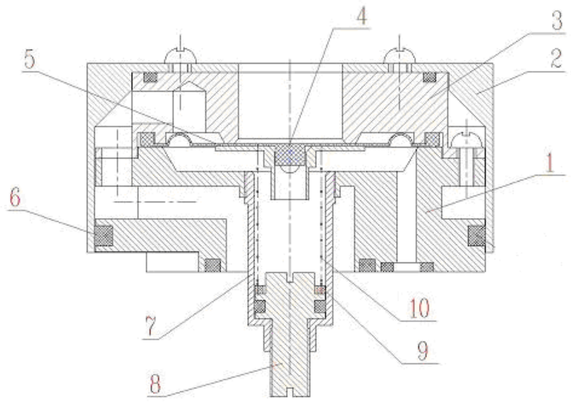
Peak Pressure Protection Valve Function:
When the bellows pressure is larger than regulated figure, the flake inside the peak pressure protection valve will open and drain out extra gas, so as to reduce the pressure inside the bellows and protect bellows.

Working Principle (refer to figure 40):

1. Firstly, charge the Bellows airbag by pressure O_2 flush on the portable machine, and make the bellows airbag to the top.

2. The gas will enter into the ventilator by pipelines, then into the bellows airbag, and will press the foldable airbag down. At the same time, the gas will affect peak pressure protection valve and PEEP valve, and perform peak pressure protection and make sure PEEP valve in good seal status.
3. Bellows foldable airbag up and down, repeatedly, and cooperate with anesthesia machine and provide driving gas to breathing circuit.

5.4.3 PEEP Valve



1 Base	**6 O Seal Ring**
2 Top Cover	**7 Spring Cover**
3 Inside Construction	**8 Screws for Adjustment**
4 Valve flake	**9 Gasket**
5 Base for spring	**10 Spring**

PEEP Valve Functions:

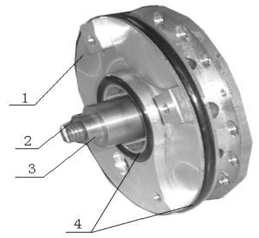
When there is too much gas inside the bellows foldable airbag, and the inside pressure is larger than the regulated figure, the PEEP valve will lower, the extra gas will be drained out by exhausted outlet, and protect the bellows.

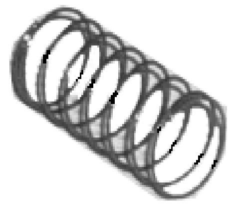
PEEP Valve

Inside Construction and O Seal Ring

Top Cover

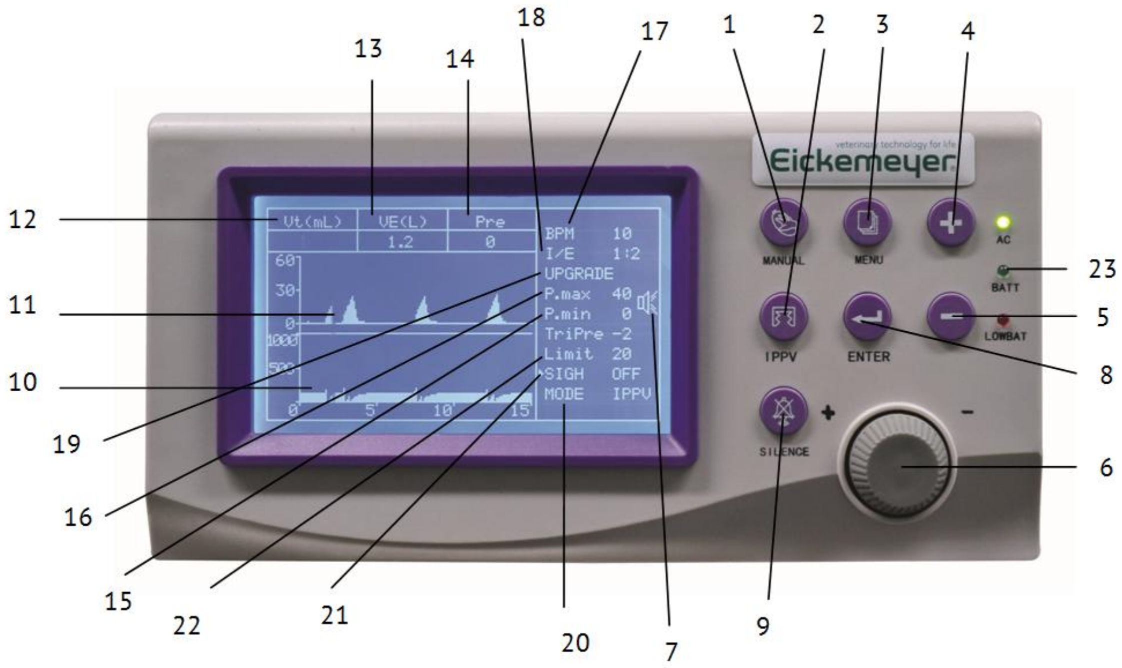
Base for Spring





1 Base	3 Spring Cover
2 Screws for Adjustment	4 O Seal Ring

5.5 Control Panel



1 MANUAL
2 IPPV (Machine Control)
3 MENU
4 Increase
5 Decrease
6 Tidal Volume Knob
7 Trigger
8 ENTER
9 SILENCE
10 Expiratory Flow Waveform
11 P-t
12 Tidal Volume
13 VE
14 Pressure
15 P. min (min. airway pressure)
16 P. max (max. airway pressure)
17 BPM (breathing times per minute)
18 I/E (inspiration/expiration) Ratio
19 Backup Function
20 MODE (respiratory mode)
21 SIGH
22 Input Pressure Limit
23 Power Light

5.5.1 ON/OFF

Connect the anesthesia machine with power. Turn the power switch on the back of the anesthesia machine. Press the ventilator power switch to start the machine. Then press the power switch to switch off the machine.

5.5.2 Setting Steps the Conventional Parameters

1. Press the "MENU" button on the control panel; you will see he triangle cursor remaining the first "BPM" of setting key parameters (see figure 41).
2. Press "+" or "−" key to select, will see the cursor move up or down.
3. When the cursor to the pre-set items, press "ENTER" button, see the cursor blinking on pre-set programs then enter the parameter setting condition.

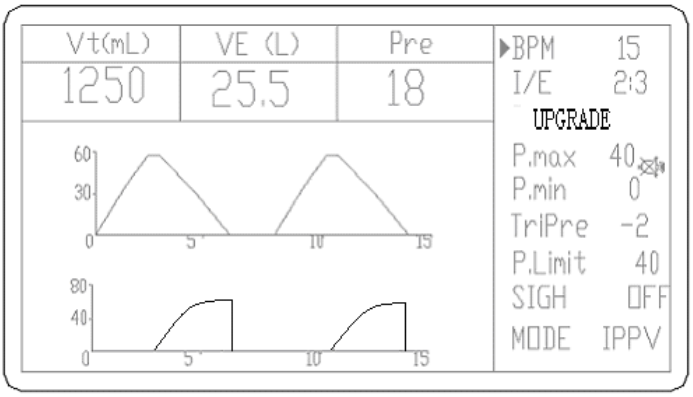


Figure 41

4. Press "+" or "−" button, you will see the parameters increasing or decreasing. Its parameters will be switched in "IPPV / SIMV / MANUL" mode under the respiration.
5. When the parameters satisfy the requirements of the operator, press "ENTER" key to confirm, the setting parameters can take effect, then the cursor will stay automatically the next parameter; If you give up the setting, press "MENU" button, the parameter is invalid, the ventilator continue to maintain the original working state.

5.5.3 Shortcuts Button of Common Functions Description

1. MANUAL: Shortcuts button for manual respiration mode. Press the button, the display will pop up dialog box (figure 42) and ask the operator whether to enter manual mode, the default is "Y (yes)", PRESS "+" or "−" key to switch option and the option will be in flashing state, then press "ENTER" key to confirm.

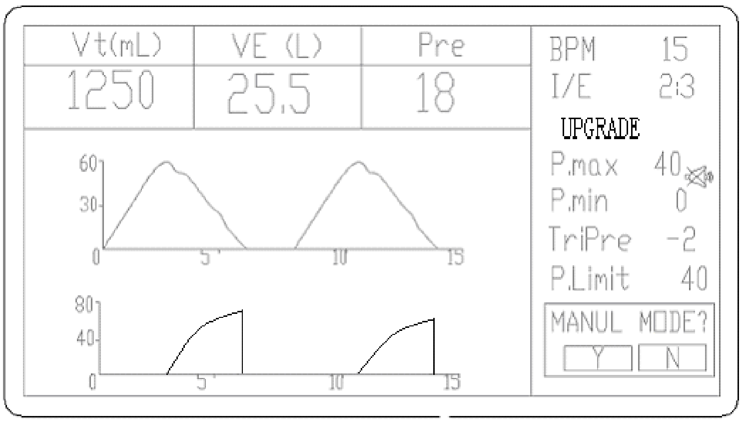


Figure 42

2. IPPV: Shortcuts button for mechanical respiration mode. Press this button; the ventilator will be in the state of machine ventilation

3. SILENCE: Silence on / off setting button. Silent settings for pressure alarm, press the button several times, Silent settings in the "open" and "off" switch and show on the display (see figure 43).

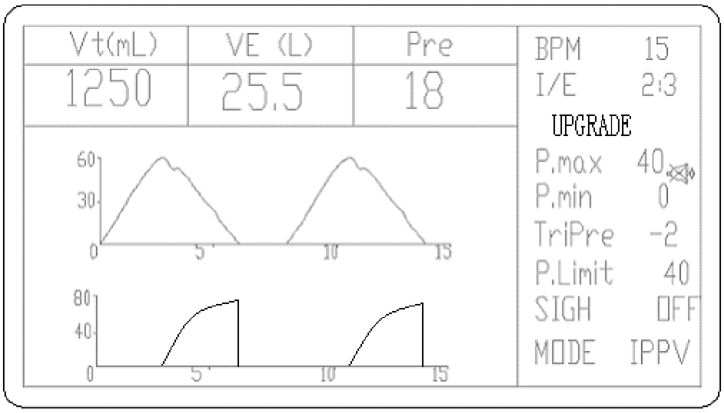


Figure 43

5.5.4 Main Feature Description of Different Respiration Mode

1. IPPV (Machine Control): In this mode, the ventilator will be in the state of setting BPM and I:E ratio, if at the same time open the SIGH function the ventilator will also carry out a sigh for each 100 respiratory cycles. The cycle is twice of the setting parameters. If the pressure exceeds set limits, then the corresponding limit will be flashing, intermittent buzzer alarm. Tidal volume (Vt) and minute ventilation (Ve) at the end of each week will be refresh, pressure (Pre) will appear at the end of each breathing cycle, aspiratory pressure values and the value of end expiratory pressure. At the same time, pressure and tidal volume waveform will show real time.

2. SIMV (Synchronous Mode): In this mode, the synchronous trigger pressure and the limited intake pressure parameters will be involved in the work of ventilator. In the aspiratory phase, if the pressure reaches or gets higher than the inlet pressure limit, stop inspiration and enter into inspiration pause. Expiratory phase, complete the setting expiratory time, if pressure is less than or equal to the synchronous trigger pressure, then the ventilator run to the next aspiratory phase of respiratory cycle. If at the same time open the SIGH function the ventilator will also carry out a sigh for each 100 respiratory cycles. The cycle is twice of the setting parameters. If the pressure exceeds set limits, then the corresponding limit will be flashing, intermittent buzzer alarm. Tidal volume (Vt) and minute ventilation (Ve) at the end of each week will be refresh, pressure (Pre) will appear at the end of each breathing cycle, aspiratory pressure values and the value of end expiratory pressure. At the same time, pressure and tidal volume waveform will show real time.

3. Protect of Synchronous Mode: Synchronous mode of protection: in the aspiratory phase, if the airway pressure has not reached the limited pressure of intake, then the aspiratory time to reach setting and stop to the inspiration. Expiratory phase, after expiratory time completed, if airway pressure is always higher than the synchronous trigger pressure, then continue to maintain tidal ventilator state of hold time for the aspiratory time settings of 1.5 times, and then into the new suction state.

4. Manual Mode: In this mode, the ventilator can judge the running state by detecting the flow.gas flow rate by detecting the airway to determine the stage of respiration, in addition to real time display of pressure waveforms, tidal volume waveforms, tidal value, pressure value as well as pressure limit alarm outside, when in the first 30 seconds, 30 seconds, the ventilator would be first display respiratory and munite ventilation, then in the second 30 seconds 60 seconds corresponding to the time of respiratory frequency and minute ventilation were second flush, and then a refresh every 20 seconds until the exit the manual mode.

5.5.5 Use of Tidal Volume Knob

Clockwise or counterclockwise rotating tidal volume tidal volume knob can adjust the tidal volume.

Note:

- Each start machine, the machine will give a set of default data: BPM "15 bpm / min; input pressure limit: 40 cm H_2O; pressure upper limit: 40 cm H_2O; pressure lower limit: 0 cm H_2O;
- Regulate a variety of data, only the cursor being in the blinking state, be regulated;
- Synchronous respiratory mode, tidal volume waveform display and sigh functions can be showed only after the product upgraded. The option "UPGRADE" is the option to be upgraded.
- Under manual mode, does not affect the parameters set of mechanical and synchronous respiratory mode, if change the respiratory parameters under this mode, then the new parameters will be effected in the next

5.6 Battery Installation

The battery of the ventilator is already built-in for delivery. However, if you have to change the battery please proceed as follows:

1. Take off the bellows: Firstly, screw off the bolts that are used to fix the bellows. With suitable force to pull backwardly the bellows, refer to figure 44 and 45.

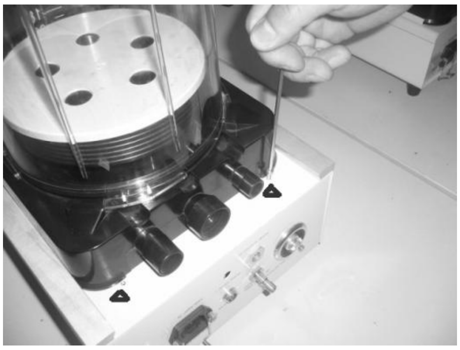


Figure 44

Figure 45

2. Take off the shell, get the 6 pcs bolts down, put the shell aside, refer to figure 46 and 47.

Figure 46

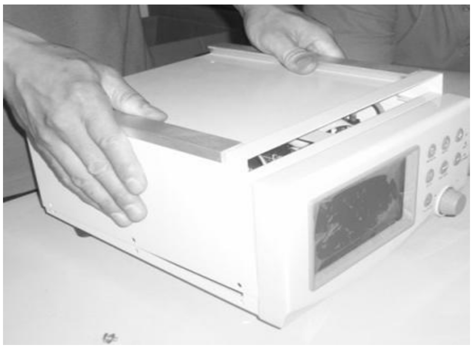


Figure 47

3. Open the back cover, take off the 2 pcs fixing bolts of pressure regulator, cut off the gas supply connector in the entrance of pressure regulator. Put the pressure regulator outside the machine, refer to figure 48, 49 and 50.

Figure 48

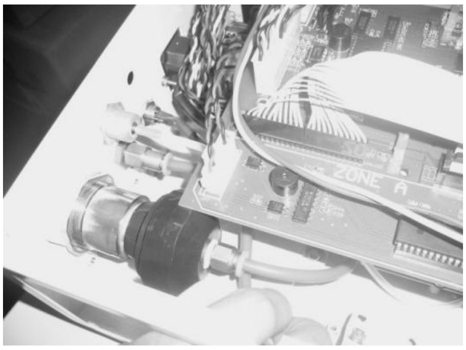


Figure 49

Cut off Tube

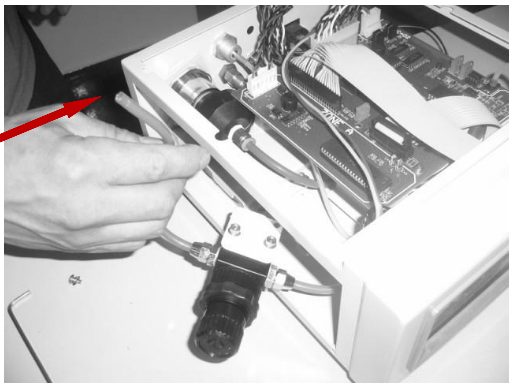
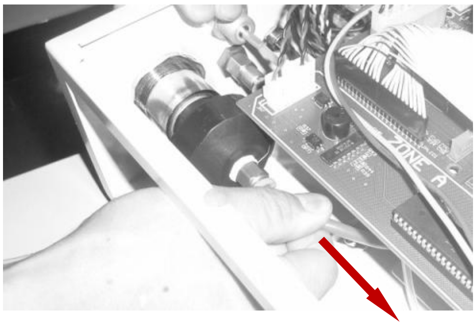


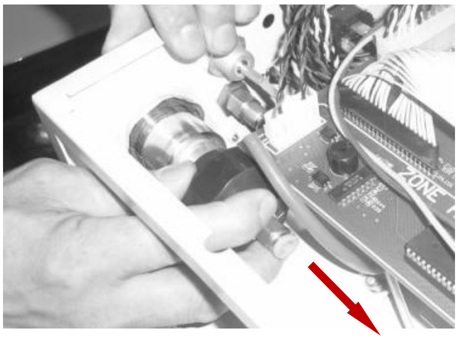
Figure 50

4. Forth, cut off the connection pipeline with driving gas valves, and with suitable force to pull it out, refer to figure 51 and 52.



Cut off Tube

Figure 51



Pull the
Valves out

Figure 52

5. Fifth, screw off the fixing bolts of battery, forcely take up the pressing plate, well connect the wires, insert the pressing plate, and screw on the fixing bolts.

Caution:

The wire connection must be correct, refer to figure 53, 54 and 55. There is only one connector with battery, the connector end is black. The connection wires are 1 yellow color and 1 black color.

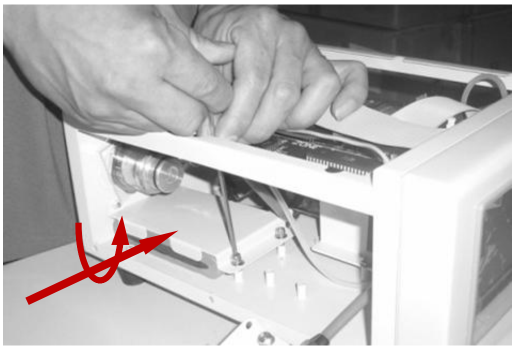


Figure 53

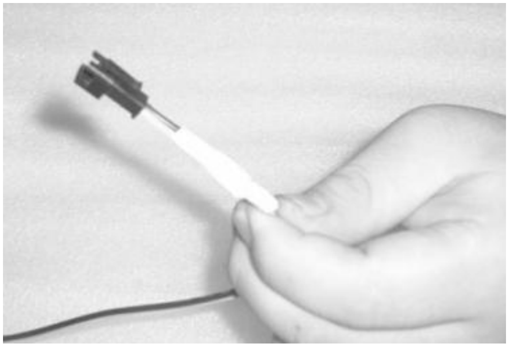


Figure 54

Figure 55

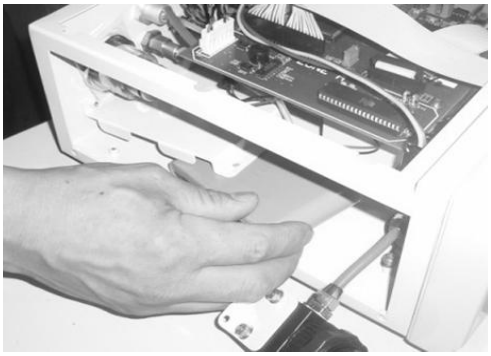


Figure 56

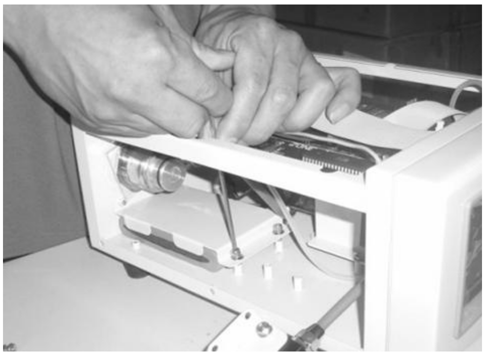


Figure 57

6. After having the battery well fixed, back the steps mentioned above. Then start the machine.

6 Cleaning and Sterilization

The cleaning and sterilization should be performed based on sterilization conditions of each hospital and the methods specifically mentioned in this section.

6.1 Surface Cleaning and Sterilization

Clean the bedplate and surface of the ventilator using a wiping cloth soaked with water soluble detergent sanitizer. Note that the detergent sanitizer should be prevented to go inside of the ventilator; never use organic solvent; the preparation of detergent sanitizer should be performed according to the requirements of its manufacturer.

6.2 Flow Sensor Cleaning

The flow sensor is a precise and easily wearable spare part, after fall down or over dirty please clean with wiping cloth soaked with water soluble detergent sanitizer.

6.3 Cleaning and Sterilization of Respiratory Pipelines

After each patient use, wash them with soapy water, and put them in 1:2000 or 0.05% iodine solution for 30 minutes, then wash with clean water and dry in the air for further use; or steam disinfection in steam sterilization chamber or immerse them into 70% alcohol solution for 30 minutes.

6.4 Replace Respiratory Pipelines

Users can replace the breathing tube according to the actual situation to ensure no leakage.

6.5 Cleaning and Sterilization of Rubber Threaded Pipe and Manual Airbag

Every used rubber threaded pipe and manual airbag must be firstly washed carefully and then put them into a steam sterilization chamber after being dried in the air or sterilized with the appropriate method for medical rubber products.

Note:

Don`t sterilize with ultraviolet rays, so as to shorten the service life of rubber products.

6.6 Cleaning and Sterilization of Spare Parts of Bellows

6.6.1 Cleaning

An assistant fixes the bellows base, then the operator grips the bellows cover with his hand, left or right rotation, bottom lock will be separate. Put up light and you can remove bellows cover. Remove the fixed folding bag at the edge of bellows, put it into hot water blended with non enzyme detergent for rubber and plastic. Reuse it using clean hot water and airing. Do not soak it longer than 15 minutes. Then wash it with clean hot water, and dry off.

Note:
Please spread the foldable airbag fully when dry it off to avoid conglutination

6.6.2 Sterilization

a) Sterilization after being used to ordinary patient

Brush it by soap water, and then use clean water to wash it several times, dry off, and then soak plastic parts and rubber parts in 70–80% alcohol for 30 minutes, take them out with tools of no bacteria, and put them in clean container. Sterilize them again before next time use. Metal parts and glass parts can be sterilized by high pressure steam. For example, at steam pressure of 1.05 kg/cm², temperature can be raised to 121 °C, and keep it for 15–20 minutes to kill most of the bacteria and germ.

b) Sterilization after being used to infectious patient

After being used to infectious patient, including phthisis, pulmonary abscess, cyanomycosis infection, lockjaw, gas gangrene, infectious, hepatitis etc, all the parts and components of bellows must be sterilized completely by two steps: initial dispose and complete dispose.

Initial Dispose

Deal with them according to insulation principles, leave all used parts and components of bellows in operation room, and take below steps after operation is finished:
Soak all bellows parts and components in hydroxybenzene solution of 1–5% for 30 minutes.

Complete Dispose

If condition allowed, fumigate parts directly contact with patient with formaldehyde or ethylene epoxide, or by soak sterilization one by one. For parts used by patient of phthisis, soak them for 30 minutes in 3% hydroxybenzene solution; for parts used by patient of lockjaw, soak them for 30 minutes in 0.2% potassium permanganate; for parts used by patient of gas gangrene, soak them for 60 minutes in 0.1% bromo-geramine, for parts used by patient of cyanomycosis infection, soak them for 120 minutes in 0.1% bromo-geramine.
After being soaked, all parts and components should be taken out and washed by clean water repeatedly, dry off for future use.
For part not directly contact with patient, use soap water to wipe, wash repeatedly, and then irradiate with ultraviolet radiation for 30 minutes if necessary.

6.7 Cleaning and Maintenance of Ventilator

6.7.1 Installation of Spare Parts Being Cleaned and Sterilized

After spare parts being cleaned and sterilized, e.g. respiratory pipelines, bellows parts etc., they should be correctly installed again, no leakage, test run. Especially the gas tightness test is very important. If everything is OK, then use it on patient.

6.7.2 Maintenance of Bellows

Warning:
When machine is working on a patient, any maintenance won't be allowed.

Check the machine every 30 days, so as to change or repair the broken parts on time. Checking contents are including: gas tightness, foldable airbag, seal ring, crack on bellows cover, and other physical performance etc.
Do not bend them. Be careful during cleaning, sterilization, and disassembly. Replace them in time if they are damaged.

7 Performance Parameter

Power:	AC 220 V, 50 Hz or 110 V, 60 Hz
Rated power:	25 W
Works mode:	IPPV, Manual
Respiration Mode:	IPPV (time control), MANUAL, SIMV SIGH, DEMO
BPM:	3–65 bpm
I/E Ratio:	8:1, 7:1, 6:1, 5:1, 4:1, 3:1, 2:1, 1.5:1, 1:1, 1:1.5, 1:2, 1:3, 1:4, 1:5, 1:6, 1:7, 1:8
TV:	50–1,600 ml
TV Monitor:	50–1,600 ml
MV Monitor:	0–99.9 l
Alarm Setting:	High or low airway pressure alarm, Power failure alarm, Low oxygen alarm
PEEP:	0–15 cm H_20

8 Troubleshooting

Troubles	Causes	Methods
Foldable airbag cannot reach the top inside the bellows cover	PEEP valve is adjusted over low	Adjust high
	Corrugated pipelines are broken or loosen in connection	Replace or well connect the pipelines again
	Driving gas valve is stuck together with other device	Take down the valve and clean it with alcohol, then put it back
Foldable airbag is incapable of ascending	Corrugated pipelines are broken or loosen in connection	Replace or well connect the pipelines again
	Solenoid valve is broken	Replace
	Driving gas valve is broken	Replace
No display figure of ventilator	Power cable is not connected	Well connect
	CPU board is broken	Replace
Tidal volume figure is not exact	Flow sensor is not in correct position	Correctly connect
	The sensor has not been calibrated for a long time	Calibrate the flow sensor
	Flow sensor is broken	Replace
Tidal volume is not being displayed	Flow sensor has not been connected	Well connect flow sensor
	Flow sensor is broken	Replace

9 Transportation and Storage

The transportation or storage environment must not exceed below limits:

Environment Temperature: -9 to +35 °C
Relative humidity limits: 20 % to 60 %
Atmosphere pressure: 0.7 to 1.06 bar

10 Appendix

10.1 Installation of Trolley

Figure 58

Figure 59

Figure 60

Installation of the tray: there are 4 holes on the tray (figure 58), and match with the 4 holes on the fixing plate (figure 59), then fix them with 4 pcs M5 x 8 bolts, refer to figure 51.

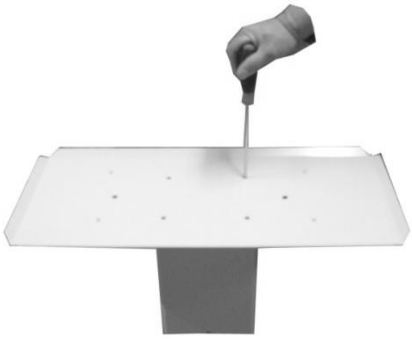


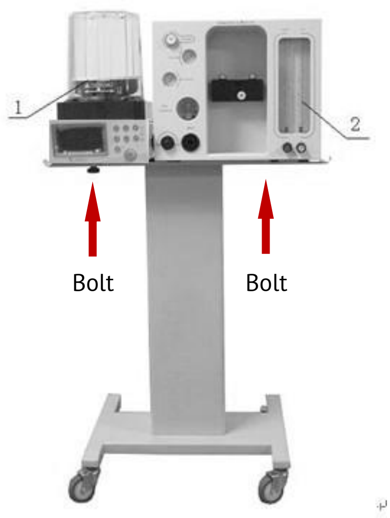
Figure 61

Fixing plate: there are 4 holes on the trolley and match with the 4 holes on the fixing plate, then fix them with 4 pcs M8 x 16 bolts, refer to figure 62.

Figure 62

Wheels installation: the wheels are well fixed.

10.2 Installation of Anesthesia Machine and Ventilator



1 Ventilator: On the left of the tray. Fix the ventilator with 1 big M8 bolt.

2 Anesthesia Machine: On the right of the tray. There are fixing corrugated holes under the anesthesia machine, and fix it with the bolts together with the machine.

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