

OPERATOR'S MANUAL

VENTILATOR

510

NewTech®

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1 General

510 portable ventilator is one of indispensable equipment in clinical emergency and treatment. Out of the great many varieties of ventilators produced home and abroad, some of which are top-grade and outstanding products. Most of ventilators are heavy in volume, inconvenient to carry, complicated in operation, needing power or regular gas source etc. which cause a great deal of inconvenience for medical personnel in the course of clinical use, especially during first aid treatment pre-hospital and transportation after operation. As a result, the primitive ball pinching method other than use of ventilator is still prevailing in the course of first aid treatment and transportation, which has brought potential safety hazards to patients. In view of such situation in the hospitals at all levels in our country, our company develop the mini-emergency ventilator which is simple to operate, small in weight and volume and reliable in performance, filling in the gap of miniature pneumatically powered ventilator trade of our country. In addition, it conforms to the principle of simple and easy operation requested for emergency equipment. The ball pinching method replaced with ventilator has freed the medical personnel's hands, improved success rate of rescuing and thus widely been used by many medical units and clinical offices at all levels to perform emergency treatment for accident affairs, such as first-aid center, ambulance, anesthesia unit, chest surgery, cranial surgery, respiratory unit, various large mines, factories, swimming places.

2 Operation

2.1 Ventilator Operation

Connect the main device with gas source by the wire of gas source, or connect the main device with gas source directly. Open the main valve of oxygen cylinder and then the manometer shows the pressure in the gas cylinder. Regulate flow valve to make flow meter indicator point at 0.35-0.4Mpa; then ventilator is in working condition. Regulate tidal volume knob and respiratory rate knob according to patient's need and if conditions permitted, test tidal volume by test-lung or moisture form to make the ventilator meet operation requirement. Lastly, use close face guard or endotracheal tube to connect ventilator. If the machine is used for a long time, a special pressure-reducing form can be located on the big oxygen cylinder. Connect the main device; open the main valve, regulate flow valve to make it in the working pressure condition. Oversight of different scales of flow meter on big and small oxygen cylinders may lead to use of high pressure and thus cause damage to the ventilator.

2.2 Phlegm-sucking device (optional)

Insert phlegm-sucking pipe into air orifice of phlegm-sucking device and the other end into gas source. Open the main valve of gas source; regulate flow valve; insert the other end of the phlegm-sucking pipe into patient's mouth; then phlegm-sucking device begins working. The suction can be controlled by the flow valve.

2.3 Humidifier (optional)

Inject proper pure water into humidifier bottle; connect nasal oxygen canula with the outlet of humidifier; connect one end of phlegm-sucking union pipe into the inlet of humidifier and the other end with gas source; open the flow valve slightly and begin inspiration.

2.4 Oxygenation

Make sure the main valve and flow valve of oxygen cylinder are in close conditions; unscrew the sealed bolt on the pressure-relief valve with the special spanner; connect big oxygen cylinder with small one by oxygen bridge and then tightened. Open the big oxygen cylinder valve and then the main valve of small oxygen cylinder slowly before oxygenation. The gas cylinder will give out "hiss" noise and then get warm; about one minute later, the noise stops and oxygenation is finished. Close the main valve of small oxygen cylinder and oxygen cylinder valve; unload oxygen bridge and screw nuts.

This chapter will mainly introduce the detailed operating method of 510 ventilator.

2.5 Structure

The front and back and flank panels drawings of the ventilator are shown in Fig. 2-1, Fig. 2-2, Fig. 2-3.



Figure 2-1 Front panel

- **Respiratory Rate**

Respiratory rate refers to the respiratory frequency at unit time. In the course of first aid treatment, respiratory rate is slightly higher than that in ordinary state.

- **Airway Pressure**

Airway pressure refers to the pressure in the respiratory track, which can directly reflect the alveolus pressure. When pressure is too high it may cause lung injury. The product equipped with airway manometer can directly show airway pressure and automatic pressure-reducing protector can avoid injuring patients by improper operation, and thus has increased the security in operation.

- Oxygen Concentration

Oxygen concentration means the content of oxygen in inspiration gas. Oxygen concentration is 21% in the air but if for heart-lungs resuscitation, pure oxygen can be used but not for a long time. This product has air-oxygen mixer which can make oxygen concentration smaller than 60%, and thus can guarantee the patient's security when it is used for a long time.

- I/E ratio

I/E ratio means inspiration and exhaling time ratio in one respiratory circling period.

1MPa is equal to 1000kPa or equivalent to 10 kilograms; 1kPa is equivalent to 10cmH₂O.



Figure 2-2 Back Panel

Air input: Don't block.

Power: AC 220V/50Hz. (Optional: AC110V/60Hz)

Fuse tube: 250V 0.5A, Φ5×20(T). (Optional: AC125V 1A, Φ5×20(T) if supply voltage is 110VAC)

Power of vehicle: DC 12V.



Figure 2-3 Side Panel

Main-machine connection:

See Fig 2-3

Gas source connection

O₂ inlet: quick connector, in clinical emergency with O₂.

Insp.: connect to breath valve with threaded pipe.

Paw: pressure sampling connector.

2.6 Accessories



Figure 2-4

Legend:

1、Ventilator	2、Oxygen cylinder (Optional)
3、Breath Valve	4、Threaded Pipe
5、Gas Pipeline	

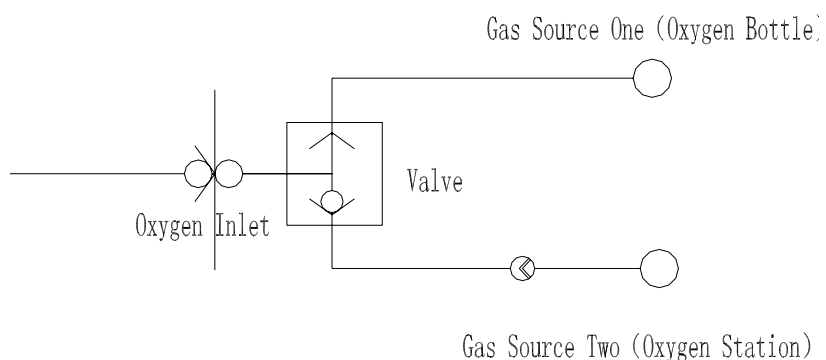


Figure 2-5

The 510 ventilator need compressed oxygen for operation. For the hospital with centralized oxygen supply, the pipe can be connected to the air and oxygen socket on the wall directly. For the hospital without centralized oxygen supply, generally the compressed oxygen is obtained from the oxygen bottle, with a pressure reducer connected to the output of the oxygen bottle.

3 Ventilation Modes

3.1 A/C

C: also called control respiration

(Figure 3-1)

The characteristic is that patient cannot control releasing airflow, and all respiratory movement all must be carried out according to the conditions set by ventilator.

Operation methods is as following:

Set the breath frequency f .

Set the ventilation volume

Upper limit setting for airway pressure: it can be set higher when turn on the ventilator, read the airway pressure peak value from the airway manometer after ventilator runs normally in A/C mode, then set the upper pressure limit 1kPa higher than the airway pressure peak value.

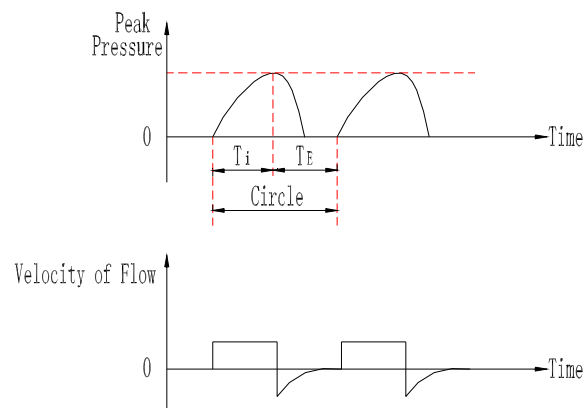


Figure 3-1 Control Ventilation Waveform

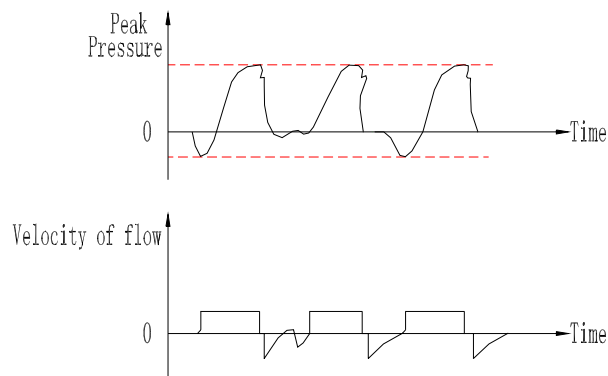


Figure 3-2 Assist Respiration Waveform

A: Namely assist respiration

(Figure3-2)

It is featured by that the patient can control the respiration frequency, while the tidal volume of the respiration, the time of the inspiration and expiration are still controlled by ventilator. To the patients who remain fully conscious and have spontaneous respiration ability, but can't conduct enough breath function, the assist respiration of the ventilator is needed.

Control the ventilation frequency f , the set value should be lower several times every minute than f total,

Set the burst electrical level: adjust around -0.3kPa .

To A, several above-mentioned parameters must be adjusted properly and must assist with vigor analysis. Other parameters adjustments are all same to C.

3.2 SIMV

Synchronization Intermittent Mandatory Ventilation

(Fig. 5-3)

This is a kind of method combined by patient independence breath and machine mandatory ventilation. The mandatory ventilation is touching off synchronous. It is used in the procedure from mandatory ventilation to independence breath before carrying down machine.

SIMV $f/2$: mandatory ventilation frequency is one half of A/C ventilation frequency. The mandatory ventilation of SIMV and independence breath is both touch off synchronous with patient, so the touch off electrical level should be set. Normal it is adjusted around -0.3kPa . The independence breathe when Other parameter settings are same as that of A/C.

SIMV $f/4$: The command ventilation frequency is one fourth of A/C ventilation frequency. Others are same as that of $f/2$.

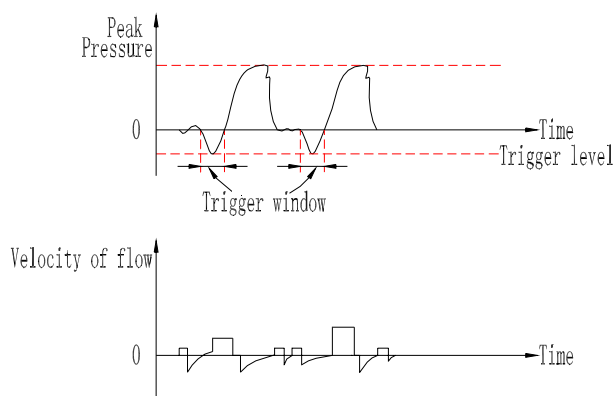


Figure 3-3 SIMV Waveform

3.3 A/C+SIGH

SIGH is that on the basis of A/C make a deep inspiration of double tidal volume every 100 times, which is adapted to the long term mechanically ventilation patient and can be used in “expanding lung” of thorax operation. When expanding lung, because requires continuous several sighs it is needed to convert ventilation method conversion switch several times between A/C and SIGH.

When signing because tidal volume is doubled and the peak value of airway press increases, the upper limit set value of airway press will increase. That is the peak value is higher 1kPa than the value of sighing, the set of other parameters are same to A/C.

3.4 SPONT

(Fig 3-4) In some hospitals, after patient has spontaneous respiration, select SPONT should be provided for the patient through facemask before offline so as to train the spontaneous respiration ability of the patient. As a routine, the methods for realizing persistent gas flow are as follows:

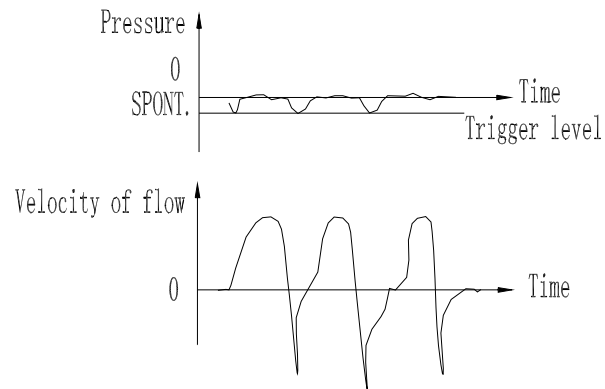


Figure 3-4 Spontaneous Waveform

4 Cleaning and Maintenance

4.1 General principle

Generally, the gas in the inspiration circuit (the part before the humidifier) is dry and clean, and flows to the patient with a certain velocity, so it is unsuitable for the bacteria to grow. While the gas in the expiration circuit is from patient, it is humid, and some patients have infectious disease, which is easy for the bacteria to increase, so the cleaning and disinfectant operations are specified in principle as follows.

4.1.1 Infective patient

Besides conducting disinfectant for the patient circuit, the gas delivery element (in the airway tank) of the expiration circuit should also be disinfected so as to avoid cross infestation between patients and prevent the ward from being polluted so that the health of staffs is affected. Refer to the above for the disinfectant method. But the flow sensor should be paid special attention, as it is precision and damageable part. For disinfectant, it is better to soak it in alcohol for an hour, and then dry it. While soaking, the plug part of the sensor should be upward and exposed in the air, it will be OK if the alcohol height can drown the ventilation hole. When positioning the disinfected sensor, pay attention to positioning the side marked with arrowhead upward (the arrow head means the flow direction).

4.1.2 Surface cleaning and sterilization

Clean the machine's panel and all surfaces with soft cloth soaked with the soluble sterilizing agent. The formation and preparation of the agent must be done in accordance with the direction given by the manufacturer. One must prevent the sterilizing agent drops from entering the anesthetic machine and the misuse of organic agent for cleaning the machine.

4.1.3 Expiratory valves cleaning

Dismount the cover of the expiratory valves by rotating it counter clockwise, then clean all parts of them with the gauze soaked with water soluble sterilizing agent, after all parts cleaned and dried recover it in original integration. Then one must check the leakage and the movement of the expiratory valves in accordance with the required regulation and checking procedure. Please handle all parts with care preventing any damage.

4.2 Maintenance of the ventilator

- Disinfect, cleaning, drying and correctly install of the easy damageable part.

The pipeline for connecting the machine and patient is easy to be polluted, so disinfectant is needed, and the method is shown in the operation manual. The airway channel, connector, etc. After disinfectant should be correctly installed in position without gas leakage. After installation, trial running should be conducted, and the machine can be connected to patient and used only after it is operated normally. It should be specially specified that the arrowed head on the flow sensor means the flow direction, and it should not be installed in reverse. After disinfectant and cleaning, it must be dried, otherwise, if there is water on the wire mesh, the resistance will increase, the expiration flow will become inaccurate, thus the reading on the expired minute volume meter will be affected.

Those parts that directly touch the patient's body are easily polluted, the sterilization must be done after every use as explained before. It must be here emphasized is that: One must do strictly the correct installation after every cleaning and sterilization. The recovered machine must be tested and ensured in good condition before putting in reuse for patients.

- Maintaining good contact for connectors

The connector comprises airway connector and circuit connector. For all the joints, rubber connectors and delivering pipes of the airway, good contact should be ensured so as to guarantee the gas circulating without gas leakage. For all the connectors in the circuit, check should be conducted before operation, especially connectors of expiration valve, as they have no locking device, main check should be carried out to prevent them from loosening.

- Correctly operation of panel knob

The panel knob should be operated carefully with slight motion. In special, the potentiometer knobs should not be screwed with force when the terminal position is attained as this may lead to dislocation. After dislocation, the set value is not accurate, which even may cause abnormal operation of the machine.

- Maintenance during operation and transportation

The location of the machine at the operation place (such as operating room, ward, monitor room) should be appropriate, so that the doctor or nurse may not touch the machine during operation, therapy or nursing of the patient. Special the airway pipeline and power supply cable on the ground should not affect walking of person so as to avoid them being contacted and causing gas failure. The knob on the panel should not be misplaced due to involuntary contact to make the set value abnormal. In transporting the machine, especially going up and down the stairs, it should be protected to avoid the cart from dumping and damaging the valuable machine.

5 Troubleshooting

Troubles	Causes	Methods
Patients breathing system leaks	Corrugated hose damaged or connector loose	Replace or reinstall properly
	Sensor connector loose	Reinstall
	Patients' respiratory loop leaks	Check as the above method
	Flow regulating switch closes	Turn on the flow regulating switch
Ventilator doesn't work normally	Source pressure is too low	Regulate source pressure

6 Accessories

Order No.	Name	Remark
122000811	Ventilator	
122000228	Hanger	
122000672	O ₂ pipeline	
230000131	Face Mask	Big model
230000078	Fillet	
230000317	Threaded pipe	Silica gel, 1.2m
240000026	Breath valve	
230000072	Simulation lung	1L
220000068	Proper wrench	
220000046	Oxygen linker	
210000173	Fuse	250V/0.5A, $\Phi 5 \times 20$
122000187	Vehicle wire	
122000224	Suction apparatus	
122000225	Gas pipeline	
130000956	Suction tube	
130001666	Vacuum tube (thick)	
240000093	Humidifying bottle	
230000204	Oxygen pipe of nasal cavity	
122000513	Connecting pipeline	
130000988	Pothead	
240000139	Oxygen cylinder	3.2L

Note: Specific configuration refers to shipping list.

7 Specifications

7.1 System technical specifications

Gas supply:	Composition	O ₂
	Pressure	0.3 to 0.5MPa
	Connector	Quick connector
Safety pressure of the airway system: ≤ 6kPa		
Ventilation mode:	A/C, Sigh, SIMV, SPONT, Manual	
Classification:	According to EN 60601-1, 920 belongs to the following classifications: General, mobile equipment.	

7.2 Ventilation Performance

Tidal volume: 0~1500mL (adjustable in succession); ±15%
 Respiration frequency (A/C Mode): 4~99 times/min (adjustable in succession)
 I: E Ratio: 2:1, 1:1, 2:3, 1:2, 1:3, 1:4; ±15%
 Oxygen concentration: 48%~100%
 Suction pressure: -25kPa
 Indication range of airway manometer: -2~10kPa
 Noise of whole set: ≤65dB(A)

7.3 Operational environment requirements

Item	Temperature	Relative Humidity	Atmospheric pressure
Operation:	0 to 40℃	≤ 85%	86 to 106kPa

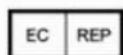
7.4 Storage

The product should be stored in the room with temperature of -10℃~40℃, relative humidity of no more than 80%, good ventilation and without corrosion gas.

Note: When the storage conditions are beyond the requirements of operational environment, and the storage state is transferred into operation state, the product only can be used after being stored in environment for over 8 hours.

7.5 Volume and Weight

	Weight	Volume (W×H×D)
Main unit	4kg	300mm×170mm×175mm
Whole set	15kg (including O ₂ cylinder)	500mm×400mm×190mm



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**VENTILATOR
WARRANTY**

NewTech Medical Limited (NewTech) guarantees to the customers that NewTech VENTILATOR machines to be free from defects for a period of eighteen (18) months and accessories for a period of three (3) months. The warranty period starts at the date of purchase.

The warranty is void if the ventilator machines have not been used in accordance with the operation manual or improperly disassembled by anyone other than NewTech.



Vinson Lau-President