

Statement

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- Equipment must be used as instructed in the operating instructions.

CAUTION: This equipment is not for family use.

CAUTION: Malfunctioning equipment may become invalid and cause bodily injury if a set of effective and approving repairing proposals cannot be submitted by the institution which is responsible for using this equipment.

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 - The label of Aeonmed original serial number or mark is removed or replaced;
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- This product is not operated correctly in accordance with the manual instruction. The power supply used or operating environment does not follow the requirements in this manual.

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Transportation and insurance charges must be prepaid by the user for transporting the product to Aeonmed for repairing. (Customers charges is added with regard to the products sold to non-Chinese mainland users)

NOTE:

Each Aeonmed product has a serial number, such as

Aeon7400A xx xx xx

Aeon7400A: machine model

the first xx : the year of manufacturing

the second xx : the month

the third xx : equipment number

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1 Introduction

1.1 What's Aeon7400A?

Aeon7400A is a compact and integrated anesthesia transmitting system. The breathing machine not only provides patients in operation with IPPV ventilation, but also monitors and displays the patient's various parameters. The ventilator used in the system is controlled by a microprocessor. Aeon7400A is intended for use in the operating room and emergency department of hospital.

Not all the optional functions available may be included in the manual. It is also possible to add other equipment to the top or middle of this system for added functions. For more information with respect to the existing product, please feel free to contact the local representatives.

 **WARNING:** The user of Aeon7400A must be professional and trained.



 **WARNING:** Aeon7400A is unsuitable for use in a magnetic resonance imaging (MRI) environment.


1.1.1 Intended Use


Aeon7400A is applicable for patients of over 25Kg with standard configuration.

 **WARNING:** Aeon7400A is not to be used for infant anaesthesia.















1.2 Symbols











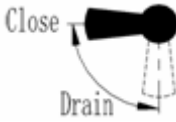
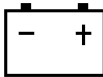

 Warnings and  Cautions indicate all the possible dangers in case of violation of the stipulations in this manual. Refer to and follow them.

 **WARNING:** indicates potential hazards to operators or patients

 **CAUTION:** indicates potential damage to equipment

Instead of illustrations, other symbols may also be utilized. Not all of them may necessarily appear in the equipment and manual. The symbols include:

	ON (Power)		Type B equipment
	OFF (Power)		Warning or Caution, ISO 7000-0434
	Alternating Current		NOTE: refer to the manual, IEC601-1
	Direct Current		Dangerous Voltage
	Protectively earth		Input
	Equipotential		Output
	Movement in one direction		Movement in two directions

	Lock		Date of manufacture
	Unlock		Address of manufacture
	Inspiration flow		Expiration flow
O ₂ +	Oxygen flush	SN	Serial Number
	Alarm Silence		View the reading on the top of float
	Ventilator operate		Bag operate
	Directions of Drain Valve		Battery
EC REP	CE Representative		The system, with this label under the stipulations in the operating manual, complies with the requirements related from 93/42/EEC.


1.3 Definition, abbreviation

Not all of the following definition or abbreviation may necessarily appear in the equipment and manual.


AC100	Code name of Circle Absorber with rotation handle
AC110	Code name of Circle Absorber with pulling handle
AGSS	Anesthetic gas scavenging transfer & receiving system
APL	Adjustable Pressure Limit
BA100	Code name of bellows for adult use
BA150	Code name of bellows for pediatric use
C	Compliance
CGO	Common Gas Outlet
f	Breath frequency
FiO ₂	Oxygen concentration
Flow-t	Flow-time waveform
I:E	Inspiration to expiration time
IPPV	Intermittent positive pressure ventilation
Manual	Manual ventilation
MV	Minute volume
Paw	Pressure of airway
P _{peak}	Peak pressure
P _{plat}	Plat pressure
Paw-t	Pressure-time waveform
V-t	Tidal volume-time waveform
F-t	Flow-Time waveform
VT	Tidal volume
V _{TI}	Inspiratory tidal volume
V _{TE}	Expiratory tidal volume

2 Anesthetic System Control


2.1 Anesthetic system


 **CAUTION:** The anesthetic system is intended to be used with the following monitoring devices, alarm systems, and protection devices:


- pressure measuring in accordance with 8.1 of ISO 8835-2;
- pressure limitation device in accordance with 51.101.1 of IEC60601-2-13;
- exhaled volume monitor in accordance with 51.101.4 of IEC60601-2-13;
- breathing system integrity alarm system in accordance with 51.101.5 of IEC60601-2-13;
- continuing pressure alarm in accordance with 51.101.6 of IEC60601-2-13;
- O₂ monitor in accordance with ISO 7767.

 **WARNING:** To avoid explosion hazards, flammable anesthetic agents such as ether and cyclopropane shall not be used in this anesthetic workstation. Only anesthetic agents which comply with the requirements for non-flammable anesthetic agents as specified in this manual.

Halothane, Desflurane, Sevoflurane, Enflurane, and Isoflurane have been found to be non-flammable agents.

 **WARNING:** Independent means of ventilation (e.g. a self-inflating manually powered resuscitator with mask) should be available whenever the anesthetic system is in use.

 **WARNING:** Do not use antistatic or electrically-conductive breathing tubes and mask.

 **WARNING:** Leakage and douse of liquid, such as anesthetic agent, bring on dangerous states or malfunctions inside device.

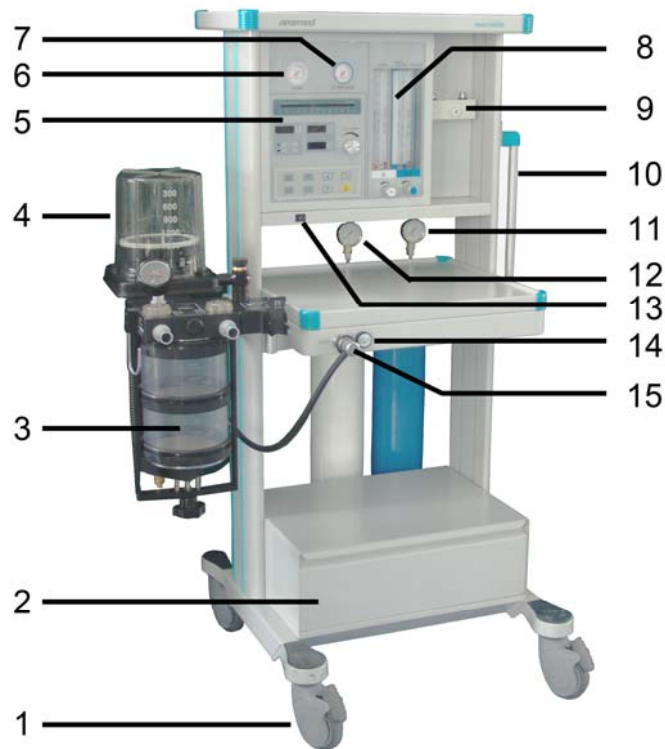



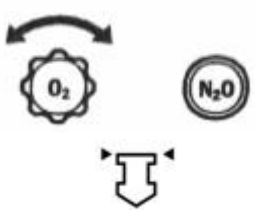


Figure 2-1 Aeon7400A front view (European version)

Legend:

1	Castor	2	Drawer
3	AC100	4	BA100
5	MV200B	6	O ₂ pipeline pressure gauge
7	N ₂ O pipeline pressure gauge	8	Flowmeters
9	Manifold valve	10	Handle
11	N ₂ O cylinder pressure gauge*	12	O ₂ cylinder pressure gauge*
13	Power switch	14	Oxygen Flush
15	CGO		

*Cylinder pressure gauges are available when Aeon7400A equipped with gas cylinders.

Figure 2-1 each control function on the front view of Aeon 7400A

Item	Diagram	Description
1 Castor (with break)		Push down to lock, and pull up to unlock.
8 Flow Control		<p>Turn the knob counterclockwise to increase the flow; turn clockwise to decrease the flow.</p> <p>Read top of float when the flowmeter is being read.</p>
14 Oxygen Flush		Press Oxygen Flush button to supply O ₂ to the breathing system with high flow rate
15 CGO		Connects the anesthesia machine to the breathing system

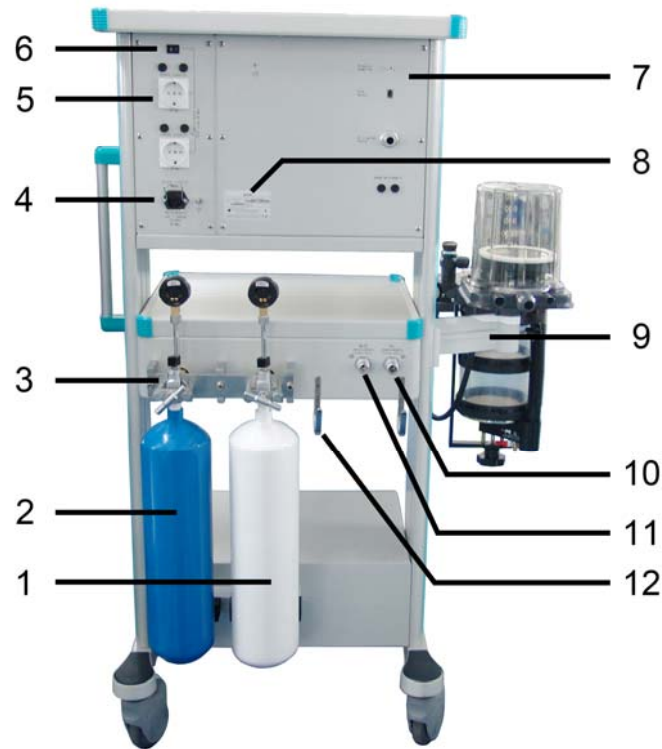


Figure 2-2 Aeon 7400A back view (European version)

Legend:

1 O ₂ cylinder (optional)	2 N ₂ O cylinder (optional)
3 Yoke system (optional)	4 Power socket
5 AMSO	6 Auxiliary mains switch
7 Rear panel of MV200B	8 Nameplate
9 Support arm	10 O ₂ pipeline inlet
11 N ₂ O pipeline inlet	12 Hook

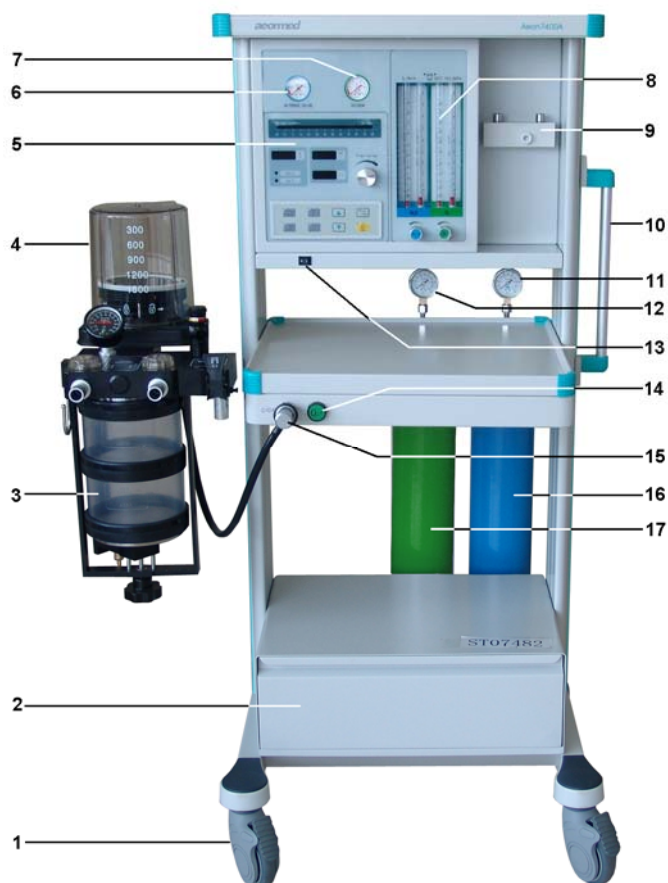


Figure 2-3 Aeon7400A front view (USA version)

Legend:

1	Castor	2	Drawer
3	AC100	4	BA100
5	MV200B	6	N ₂ O pipeline pressure gauge
7	O ₂ pipeline pressure gauge	8	Flowmeters
9	Manifold valve	10	Handle
11	N ₂ O cylinder pressure gauge*	12	O ₂ cylinder pressure gauge*
13	Power switch	14	Oxygen Flush
15	CGO	16	N ₂ O cylinder (optional)
17	O ₂ cylinder (optional)		

*Cylinder pressure gauges are available when Aeon7400A equipped with gas cylinders.



Figure 2-4 Aeon 7400A back view (USA version)

Legend:

1	Yoke system (optional)	2	Power socket
3	Fuse	4	AMSO
5	Auxiliary mains switch	6	Rear panel of MV200B
7	N ₂ O pipeline inlet	8	O ₂ pipeline inlet
9	Hook		

2.2 The Breathing system module

⚠ CAUTION: Any adult anesthetic ventilator system used together with the anesthetic gas supply system must be in accordance with ISO 8835-2.

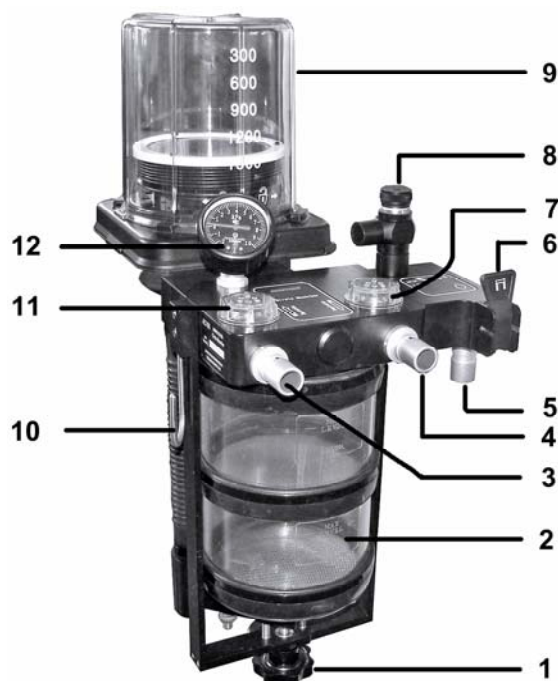
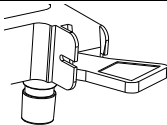
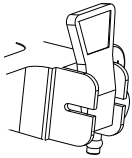


Figure 2-5 Breathing system module

Legend:

1 Absorber mount release handle	2 Absorber (Carbon dioxide absorbent)
3 Expiratory Port (Patient circuit connector)	4 Inspiratory Port (Patient circuit connector)
5 Manual reservoir bag port	6 Bag / Ventilator switch
7 Inspiratory valve	8 APL valve
9 Bellows assembly (IPPV ventilation)	10 Hook
11 Expiratory valve	12 Airway pressure gauge

Figure 2-5 the breathing system components function control

Item	Description
1 Absorber mount release	Two soda lime canisters are applied with a volume of 1500mL for each so that it can be continuously used for 6 to 8 hours at full load. The water from the reaction is drained via the water collector underneath.
6 Bag / Ventilator switch	<p data-bbox="531 584 799 618">IPPV ventilation "off":</p> <div data-bbox="927 521 1094 645" style="text-align: center;">  </div> <p data-bbox="927 658 1222 692">(gas into reservoir bag)</p> <hr/> <p data-bbox="531 786 799 819">IPPV ventilation "on":</p> <div data-bbox="927 712 1058 869" style="text-align: center;">  </div> <p data-bbox="927 882 1150 916">(gas into bellows)</p> <p data-bbox="531 927 1302 999">Select manual ventilation (reservoir bag) or IPPV ventilation (ventilator).</p>
8 APL valve	Adjust the pressure limit of the breathing system during the manual ventilation process. The readings are approximate. The colors represent different pressure zones. Green represents safety zone; yellow represents transition zone; red represents high pressure zone. Adjusting ranges between 0.19-6kPa.

2.2.1 Bellows assembly Ports

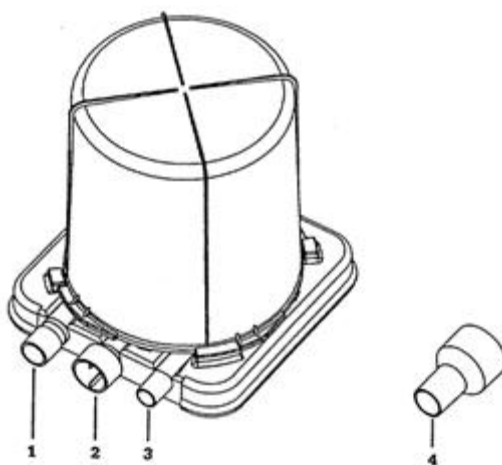


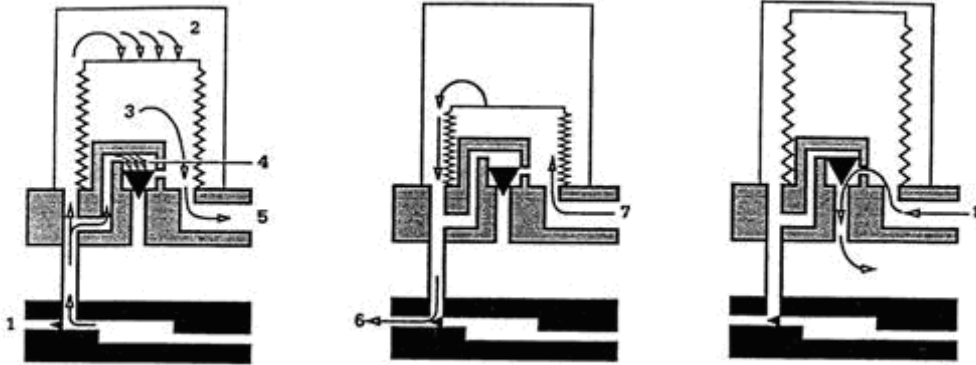
Figure 2-6 Ports of bellows assembly

1 Breathing system connector 2 Exhaust gas port 3 Driving gas connector 4 Adapter

⚠ WARNING: Never connect exhaust gas port with sub-atmospheric system directly. Or else leakage of breathing system generates.

The adapter can be used to connect the waste gas scavenging system to the bellows assembly if the standard pipeline is used in the waste gas scavenging system.

2.2.2 Ventilating circulation



Inhalation primary phase:

1 Exhalation valve

2 Driving gas

3 Gas of patient circuit

4 Pressure-relief valve

5 To patient circuit

Exhalation primary phase:

6 Driving gas

7 From patient circuit

Exhalation end phase:

8 Excess gas of patient circuit

2.3 Vaporizer Control

Refer to operating and maintenance manual of vaporizer for more details.

⚠ WARNING: Anesthetic vapor delivery device used with anesthetic system must be in accordance with ISO 8835-4.

2.4 Ventilator Control

⚠ CAUTION: Anesthetic ventilator accords with ISO 8835-5.

⚠ CAUTION: Monitoring conditions of this system: Ambient temperature: 29°C;

Air temperature: 30°C; Air humidity: 30%; Gas component: Oxygen.

⚠ CAUTION: If the temperature of sensor is lower than dew point of breathing gas, vapor may coagulate on the surface of sensor, and oxygen concentration monitored may be lower than practice value.

⚠ CAUTION: If the temperature of sensor is lower than dew point of breathing gas, vapor may coagulate on the surface of sensor, and tidal volume monitored may be lower than practice value.

2.4.1 Front Panel

Front panel consists of display screen, keys, indicators, and a knob.

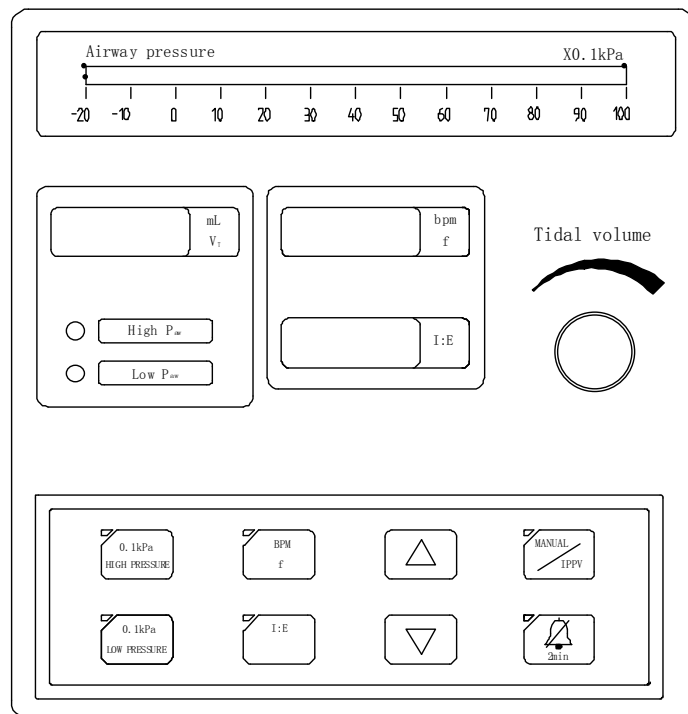


Figure 2-7 Front Panel

2.4.1.1 Control part

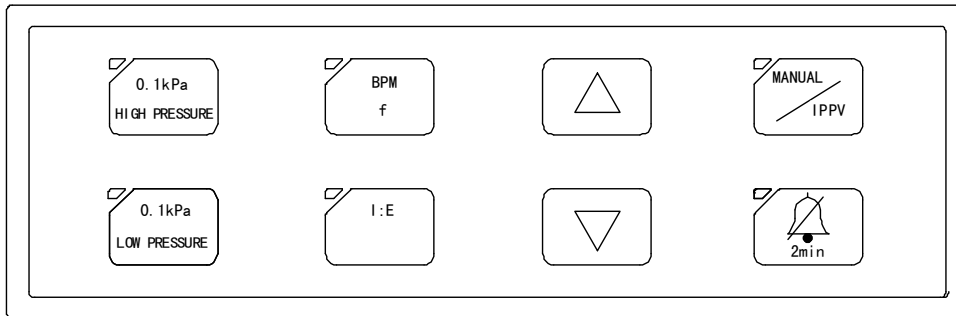

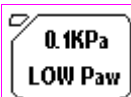
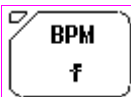
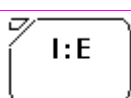

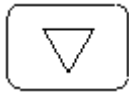


Figure 2-8 Control Part

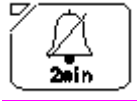
Items	Function
	High airway pressure limit setting key.
	Low airway pressure limit setting key.
	Respiratory frequency setting key ranging from six to sixty bpm.
	Inspiration and respiratory ratio setting key, totally six positions: 1:4, 1:3, 1:2, 2:3, 1:1, 2:1.
	Increase each parameter's value on screen. (Increasing key)



Decrease each parameter's value on screen. (Decreasing key)



Manual/IPPV change switch



Eliminate alarm. When alarming, press the key to eliminate alarm.

2.4.1.2 Display Screen

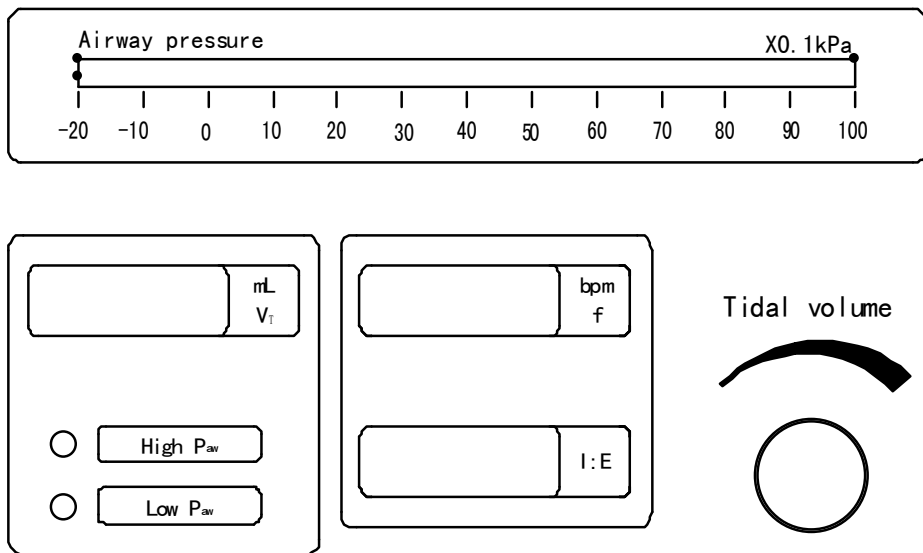



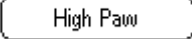
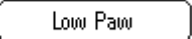


Figure 2-9 Display Screen

Display symbol's implication	Function
Airway pressure	Airway pressure display Reflect the airway pressure change when patients respiration.
	Display the tidal volume value.
	Display Respiratory frequency.
	Display Inspiration and respiratory ratio.
<input type="radio"/> 	Alarm indicator for High Paw.
<input type="radio"/> 	Alarm indicator for Low Paw.

2.4.1.3 Others

The nether picture shows the drawings of the power switch and the tidal volume control knob.

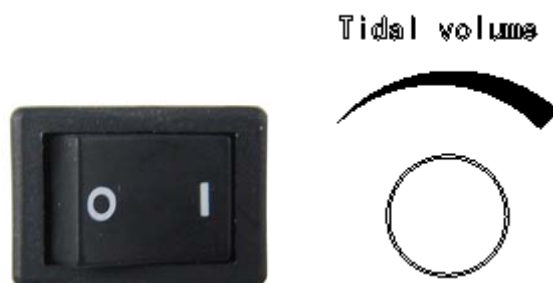


Figure 2-10 Others Part

Items	Function
Power switch	"I" is the denotation of "switch on", and the "O" is the denotation of "switch off".
Tidal Volume control knob	Using for inspiratory V_T . Turn the knob clockwise to enlarge the V_T .

2.4.2 Rear Panel

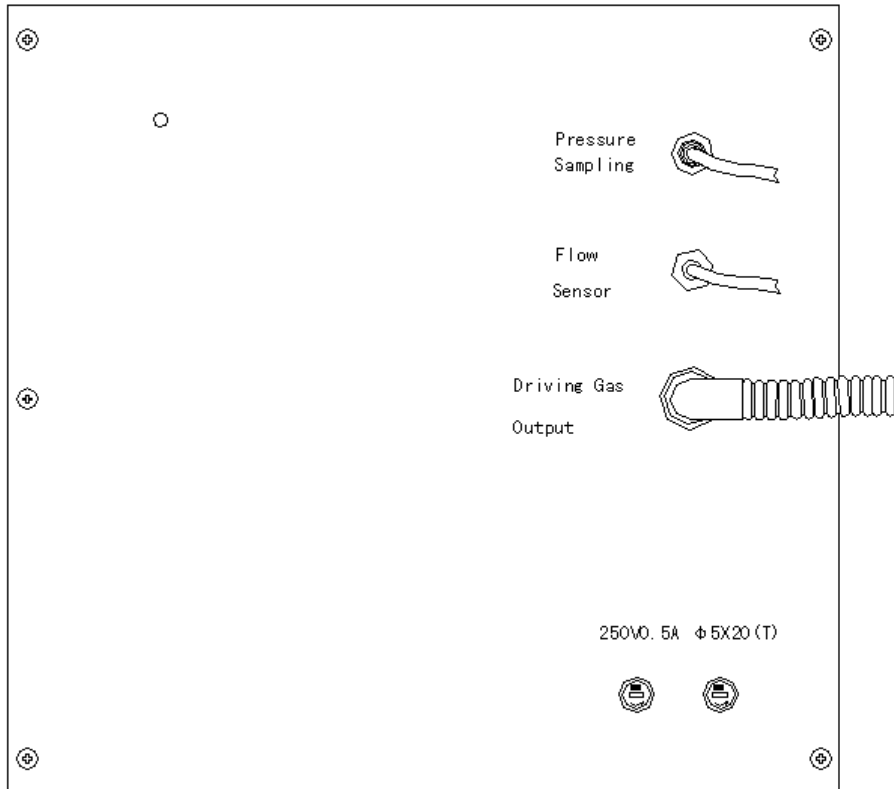


Figure 2-11 Rear Panel

Legend:

Items	Function
Pressure Sampling:	Gather Paw by pressure sampling port and then transfer them to the system at real time to offer gist for system's monitor and trouble judgment.
Flow Sensor:	The monitor of VT is gained from the flow, which was gathered by the Flow Sensor.
Driving Gas Output:	Offer driving gas to drive bellows.
Fuse:	Please refer to section 10.3

3 Operating Guide


3.1 Starting System

Step 1: Connect power supply

Plug the power cord into AC power outlet.

Step 2: Power-on


Set power switch to ON (“I”).

 **WARNING** If any unusual malfunction appears, change bag / ventilator switch to manual mode, stop mechanical ventilating.

3.1.1 Alarm Limit Set

Step 1



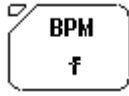
Press , the indicator light on the top left corner will be lightened and this shows the upper limit of Paw can be reset now.

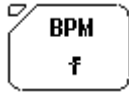
Step 2

Pressing the keys of Δ or ∇ , the position of the red light on the right side of the Paw display tube will be changed which shows the upper limit of the Paw has been reset.


Reset of the lower limit of Paw is the same.

3.1.2 Ventilator Control Set



Press , the indicator light on the top left corner will be lightened and then press Δ or ∇ to reset the RATE.



Press , the indicator light on the top left corner will be lightened and then press Δ or ∇ to reset the RATIO.

3.2 Starting IPPV Ventilation

⚠ WARNING: Before getting started, make sure to set the patient circuit installing and controlling correctly.

The following procedures assume that the system is in on position and manual reservoir gas ventilating mode.

Step 1

Make sure the control settings according with the clinical settings.

Step 2


Set the reservoir bag / ventilator switch to ventilator position.



IPPV ventilation ON (gas goes to the bellow)

Step 3



Press  key to make the light on the top left corner dark. That means had selected the IPPV ventilation mode.

Step 4

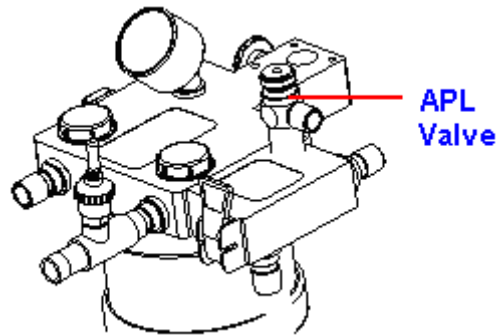
Fill the bellows with O₂ flush if necessary.

3.3 Starting Manual Ventilation

Step 1

Before stopping the IPPV ventilation, make sure the setting of manual circuit is complete, and the setting of APL valve is correct.

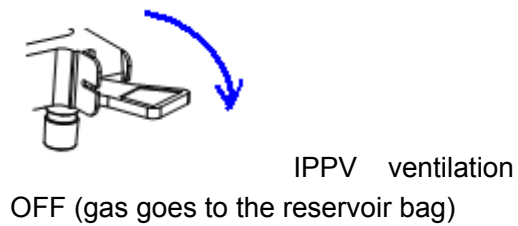
This valve is used to adjust the pressure limit of the breathing system during the manual ventilation period.



Step 2

Pressing the Manual/IPPV key, stop IPPV ventilation (ventilator).

Set the reservoir bag / ventilation switch to reservoir bag position, you can use manual mode ventilation.



⚠ CAUTION: Take the monitoring reading of the anesthetic ventilator rather than the observed reading of the bellows.


4 Preoperative Checkout

4.1 Preoperative Checkout procedures

Test interval Preoperative Checkout should be done in the following situation:
Before the first patient's use everyday.
Before every patient's use.
Perform the programs according to requirements after repair or maintenance.

Test schedule is given in the table below:

Before use of the first patient each day	Before use of each patient
System check:	Breathing system test:
Power failure alarm test:	Ventilator test:
Gas pipeline and gas cylinder test:	
Flow control test:	
Vaporizer installation and test	
Alarm test:	
Breathing system test:	
Ventilator test:	

 **WARNING:** Do not use this system before the operation and maintenance manual are read and understood.


- Whole system connection
- All warnings and cautions
- Using guide of each system module
- Testing method of each system module

Before using this system:

- Complete all tests of this section
- Test all the rest of system modules


If test failure, do not use this system. Please contact service representative.

4.1.1 System Checkout

 **WARNING:** Make sure the breathing circuit is connected correctly and in good condition.

Make sure:

- 1 Equipment is in good condition.
- 2 All the components are correctly connected.
- 3 Breathing circuit is correctly connected and in good condition; there is sufficient absorbent in the breathing system.
- 4 Vaporizer is in lock position and is filled with sufficient anesthetic.
- 5 The connection and pressure of pipeline gas supply system are correct.
- 6 The connected cylinder valve should be closed if there are backup cylinders.

 **WARNING:** Do not leave the cylinder valves open during pipeline gas supply period; otherwise, cylinder gas supply will be used up and lead to insufficient supply in case of pipeline malfunction.


7. The required emergency device is ready and in good condition.
8. The device for airway maintenance, organ cannula are ready and in good condition.
9. The applicable anesthetic and emergency medicine are ready.
10. Make sure the truckles are tight and locked and free of motion.


Connect the power cord to the AC power outlet.

4.1.2 Mains failure alarm test

- 1 Turn power switch to "I".
- 2 After operating 5 minutes, pull out power cord.
- 3 Make sure that power off failure alarm sound.
- 4 Connect power cord again.
- 5 Make sure the alarm eliminate.


4.2 Testing gas supply pipeline and gas cylinder

 **CAUTION:** A user must confirm that gas supply is connected correctly; there is no any disconnection, leakage, faulty connection in gas circuits and pressure indicates correctly. Stop using and check gas connections if abnormal.

 **CAUTION:** To prevent from damage:
Open cylinder valve slowly.
Never control the flow with excessive force.
Skip step 2 if the system is not using cylinder gas supply.

- 1 Disconnect all pipeline gas supply and close all the cylinder valves.
 - If the readings of the pipeline pressure gauge and cylinder pressure gauge are not zero.
 - Switch on O₂ supply.
 - Adjust flow control to middle range.
 - Make sure all the pressure gauges are reset to zero except the O₂ pressure gauge.
 - Switch off O₂ supply.
 - Make sure the O₂ pressure gauge is reset to zero. The low O₂ supply alarm should be on when pressure drops.
- 2 Make sure cylinders are fully filled:
 - Open each cylinder valve.
 - Make sure the pressure of each cylinder is high enough. In case the pressure is insufficient, close the corresponding cylinder valve and install a fully filled cylinder.
- 3 Test cylinder high pressure leak one by one.
- 4 Close flowmeters.
- 5 Open the cylinders.
- 6 Record the cylinder pressures.
- 7 Close the cylinder valves.
- 8 Begin to record the pressures after one minute. If O₂ pressure drops to 5000kPa, it means there is a leakage:
 - If leakage exists, according to direction of section 5.5, replace a new sheet gasket, and then tighten T handle.
 - Perform this step again. If leakage exists all the same, do not use this system.


- 9 Step 5~7 should be repeated for all the cylinders. N₂O pressure drop in one minute should not exceed 700kPa.
- 10 Close all the cylinder valves.

 CAUTION: Do not leave the cylinder valves open during pipeline gas supply period; otherwise, cylinder gas supply will be used up and lead to insufficient supply in case of pipeline malfunction.

- 11 Connect pipeline gas supply.
- 12 Check pipeline pressure according to the table below:

ANSI (U.S. and International), Australia, Canada, France and Japan	345kPa (50 psig)
ISO, Italy, Scandinavia, South Africa, Spain and Switzerland	414kPa (60 psig)
Austria and Germany	500kPa (75 psig)


4.3 Monitoring Flow Control

 **WARNING:** The monitoring system cannot be replaced by link system. The fresh gas containing enough oxygen may not avoid the existence of low oxygen mixture in the breathing circuit.

If N₂O exists, it will pass through the system during the test, which should be securely collected and removed.

Patients may be injured by improper gas mixture. The link system should not be used if a proper ratio of O₂ and N₂O is not possible.

The following procedures can test whether the link system has serious malfunction; however, it cannot determine whether the calibration is correct.

 **CAUTION:** The gas flow switch should be adjusted slowly. Do not turn it hard when the reading of the flowmeter goes beyond the maximum or minimum flow rate; otherwise, the control valve can be damaged and the control will not work.

Follow the steps to test the flow control:

1. Connect the pipeline gas supply or open the cylinder valves slowly.
2. Turn clockwise all the flow control till the end.
3. Turn on power switch.
4. Make sure:
 - No gas flowing in any flow tube.
 - Step 5 and step 6 are only applicable for the N₂O system test.



WARNING: During Step 5 to Step 6, keep link systems working state.

Only adjust testing of control (N₂O in step 5 and O₂ in step 6).

Adjust flow according to order (N₂O firstly O₂ secondly).

If adjustable range exceeds, please adjust flow control to the nearest place and perform this step again.

5. To test the flow increase of the link system:

- Turn clockwise the N₂O and O₂ flow control till the end.
- Turn counterclockwise the N₂O flow control slowly.
- Set N₂O flow control to the rate described in the following table. The O₂ flow must be higher than the minimum flow limit.

Set N₂O flow to (liters per minute):	O₂ flow must be higher than the minimum flow (liters per minute):
1.5	0.5
3.0	1.0
6.0	2.0
9.0	3.0

7. This step tests the function of the Link System when flow is reduced, you should:

Set N₂O flow to (liters per minute):	O₂ flow must be higher than the minimum flow (liters per minute):
2.0	6.0
1.0	3.0
0.5	1.5

8. Adjust full flow of all the gas to ensure that the flowmeter float must move smoothly.
9. Shut off the oxygen supply either by closing the oxygen cylinder valve, or by disconnecting the oxygen pipeline supply.
10. Make sure:
 - As pressure decreases, the oxygen-supply failure alarm must continuously sound.
 - Disconnect the flow of nitrous oxide and oxygen to be sure that the oxygen flow will be the last to stop.
 - If the oxygen is the driving gas of the ventilator, the oxygen-supply failure alarm must continuously sound.
11. Turn all control valves completely clockwise to the close.
12. Reconnect oxygen pipeline supplies or slowly open the oxygen cylinder valve.
13. Turn off power switch.

4.4 Installing and testing of vaporizer

Please refer to the User Manual of the vaporizer.

4.5 Alarm testing

1. Oxygen Pressure Low Alarm:

Depress the oxygen pressure gradually. The alarm for oxygen pressure low should occur when the pressure is lower than 0.2MPa.

2. High Paw Alarm:

Regulate V_T , make the indication of the peak Paw become 2.5kPa. Then reset the upper limit of the High Paw alarm, when the value is under 2.5kPa, High Paw alarm (audible and visual) should occur.

3. Low Paw Alarm:

Reset the upper limit of the Low Paw alarm to 0.1kPa, pick off the tube, and the audible and visual alarm should occur after 4~15 seconds.

4.6 Testing the Breathing System

Refer to the operating manual and:

Verify the non-return valve in the Breathing circuit module works normally:

The non-return exhalation valve will ascend during the exhalation period while it will descend during the inhalation period.



WARNING: Objects in the breathing system can interrupt or disrupt the delivery of breathing system gas, resulting in possible patient death or injury:

Do not use any testing plug small enough to slip completely into the breathing system.

4.6.1 Checking Oxygen flush button

Press the O₂+ button (the sound of gas should be heard from the fresh gas outlet) then release. The button must immediately drop back to its position and stop delivering the gas.


4.6.2 Testing Breathing System

Set the Bag/Ventilator switch to Bag control. The airway pressure gauge is zeroed. APL Valve should be rotated fully clockwise to the maximum. Connect corrugated tubing, Y-piece to the simulation lung.

Connect reservoir bag to the manual reservoir bag port of absorber circle. Press the O₂+ button or open the flowmeter to make the indication of the airway pressure gauge achieve 3kPa, then release the button and close the flowmeter. After 20 seconds observation, the pressure drop indicated by the airway pressure gauge must not exceed 0.3kPa.

4.6.3 Testing APL Valve

Adjust the positions of every switch and knob according to the method of testing Breathing System Leak. Open the O₂ flow to 5L/min. Adjust the APL valve to position the pressure of the pressure gauge in different places respectively. The common gas outlet must overflow some gas as the pressure is stable.

 **WARNING:** Be sure that there is no any testing plug or foreign objects in the Breathing System.

4.7 Testing Ventilator

- 1 Connect the simulation lung to the patient end.
- 2 Set the Bag / Ventilator switch to the bag position.
- 3 Turn on power switch.
- 4 Set control options:




Ventilation mode:	IPPV mode
Ventilator:	V _T : 700ml f: 20bpm I:E: 1:2 High Paw: 40cmH ₂ O
Anesthetic machine:	O ₂ flow: less than 200mL N ₂ O flow: close

- 5 Set the Bag / Ventilator switch to ventilator control.
- 6 Press the O₂+ button to inflate the bellows.
- 7 Ensure:
 - IPPV ventilation start.
 - No low pressure alarm.
 - Ventilator displays the correct data.
 - The bellows up and down during IPPV ventilation.


-
- 8 Set the O₂ flow control to 5L/min.
 - 9 Ensure:
 - Ending expiratory pressure is less than 3cmH₂O.
 - Ventilator displays the correct data.
 - The bellows inflate and scavenge during IPPV ventilation.
 - 10 Set the ventilator control and alarm limits to the proper clinical level.
 - 11 Turn off mains supply and close all valves of gas cylinders if not to use the system.
 - 12 Ensure that the things in the following table should be prepared completely.

Apparatus:	Airway maintenance Manual ventilation Organ cannula
anesthesia and emergent drugs applicably	

- 13 System preparation:
 - Close all vaporizers.
 - Open the APL valve.
 - Set the bag / ventilator switch to bag control.
 - Set all the flow controls to the close.
 - Be sure that the breathing system connects correctly.


-  **WARNING:** Be sure that the breathing system connects correctly.
-  **WARNING:** Flush the anesthesia machine for at least one minute by using O₂ with 5L/min flow speed to remove unnecessary mixed gas and objects in the system before connecting the equipment to the patient end.
-  **WARNING:** Anesthesia equipment must be connected to the waste gas scavenging system to outlet the waste gas to prevent the staff working in the operating rooms from injury.
- This requirement must be followed in the testing and clinical application.


5 Installing and Connecting


 **CAUTION:** O₂ monitoring must be used on this equipment. For the related stipulations, refer to local standards.


 **CAUTION:** According to the European standard EN 740 and International Standard IEC 60601-2-13 / ISO 8835-1, this equipment must use expiratory volume monitoring, O₂ monitoring (in accordance with EN 12342 or ISO 7767) and CO₂ monitoring (in accordance with EN 864 or ISO 9918).


 **CAUTION:** Anesthetic monitoring (in accordance with ISO 21647:2004) must be made as the anesthetic vaporizer is being used according to the European standard EN 740 and International Standard IEC 60601-2-13 / ISO 8835-1.


 **WARNING:** Operating room environment can be influenced by the expiratory gas. Some unexpected dangers may occur if the anesthetic has been not tested for a long time. The operator must dispose of expiratory gas in a timely fashion according as required, and examine other items to minimize the chances of danger and malfunction.

 **WARNING:** Be sure the gas pipeline supply hoses and the breathing circuit components are non-poisonous, do not cause patient allergy, and do not create dangerous by-product through reaction with the anesthesia gas or the anesthetic.


 **WARNING:** To prevent generating wrong data and malfunction, please use the cables, hoses, and tubes from Aeonmed.

 **CAUTION:** It is dangerous if there is anesthetic in the absorber. Measures must be made to prevent the soda lime in the absorber from drying. Turn off all the gas supplies after finishing using the system.

 **CAUTION:** This system can be operated correctly under IEC 60601-1-2 interference. Higher-level interference may cause alarm and result in auto ventilation suspension.

 **CAUTION:** To avoid equipment false alarm caused by high strength electric field:

- Put the electricity surgical conducting wire far from the place where the breathing system is put on.
- Do not put the electricity surgical conducting wire on any parts of the anesthetic system.

 **CAUTION:** To protect the patient, as the electricity surgical equipment is being used:

- Monitor and ensure that all the life supporting and monitoring equipment are operated correctly.
- Ensure that the backup manual ventilator can be used immediately in case that electricity surgical equipment cannot secure the use of ventilator.
- Never use electrical conduction masks or hoses.

5.1 Installing Product

Step 1

Unpack the bottom package, take out the shelf and lock its castors so it cannot move freely.

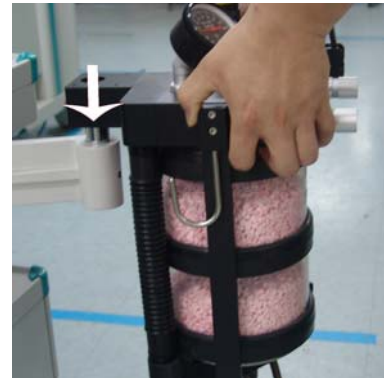
Step 2

Connect the support arm to its mounting tracks, and then tighten the screws.



Step 3

When installing, hold the top plate of the breathing circuit with both hands, connect the position fixing hole to the limb post, sit it on the limb post,



Then tighten the knob.



Step 4

Connect the mounting plate to the bolt hole of the absorber cycle, and then tighten the screws.



Step 5

Place bellows assembly on the mounting plate, then push the locking clamp.



Tighten the knob below the mounting plate to fix the bellows assembly.



5.2 Installing Absorber

⚠ CAUTION: The Aeon7400A shall comply with configurations and conditions under which clause 24 of the General Standard IEC 601-1.

⚠ WARNING: Follow the proper security measures:

- Do not use the absorber if the anesthetic is chloroform or trichloroethylene.
- Avoid the skin or eyes touching the materials in the absorber. Clean the affected part immediately and seek medical attention if materials come in contact with skin or eyes.
- Do not replace absorber during the period of ventilating.
- Replace the absorbent often to prevent the deposition of non-metabolism gas as the system is not on.
- Check the color of the absorbent after finishing each case. The original color of the absorbent may be restored when not in use. Refer to the labels of the absorbent for the details.
- Carbon monoxide is released if completely dried absorbent contact with the anesthetic. Replace the absorbent for security.
- Perform leakage testing of breathing system in bag control mode after disassembling the absorber.

The absorber in this system can be used repetitious.

The capacity of each absorber is 1500mL.

Only air, oxygen, carbon monoxide, halothane, enflurane, isoflurane, sevoflurane and desflurane can be used for the absorber.

5.2.1 When to replace absorbent

Changed color of the soda lime in the absorbent indicates that it has absorbed the carbon dioxide; however, this color is not 100% accurate. To decide whether to replace the absorbent, use CO₂ monitoring machine.

Remove the changed-color absorbent immediately. The soda lime will restore its original color several hours later and that may mislead the operator.

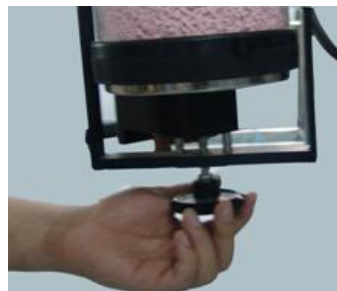
5.2.2 Disassembling Absorber

The absorber is reusable. Follow the disassembling procedures:

-
- 1 Turn on drain valve to get rid of water generated by chemical reaction.



-
- 2 Rotate the handle clockwise to disassemble the absorber.



-
- 3 Tip and take out the absorber.



5.2.3 Filling Absorbent

- 1 Remove the absorbent of absorber.
- 2 Cleaning and disinfection refer to section 6.3.
- 3 Fill the absorber with fresh absorbent after dryness. Wipe soda lime fell on the edge of absorber, and then install it back. Make sure the airtightness is well, and that no leakage and spillage.

5.3 Connecting tubes and lines

⚠ CAUTION: CO₂ monitor (in accordance with ISO 9918) should be connected at L-piece of patient end.

⚠ CAUTION: Anesthetic agent monitor (in accordance with ISO 21647:2004) should be connected at T-piece installed inspiratory port..

⚠ CAUTION When connect tubes, the junction should be close and tight.

Step 1

Connect the common gas outlet and the fresh gas inlet with pipe, and then screw down the cap to fix.

⚠ CAUTION:

This step had batter be finished before installing the bellows.



Step 2

Connect bellows with absorber circuit using a corrugated tubing ($\Phi 22$).



Step 3

Connect bellows with inspiratory port on the rear panel of the ventilator using a corrugated tubing ($\Phi 17$).



Step 4

Connect the pressure sampling T-piece on to the Inhalation port. Then connect one end of the pressure sampling pipe onto the T-piece.



The other end of the pressure sampling pipe was connected onto the pressure sampling port on the rear panel.



Step 5

Connect the flow sensor subassembly.
First connect turbine sensor onto the
exhalation port.



White probe was chucked onto the
turbine sensor.

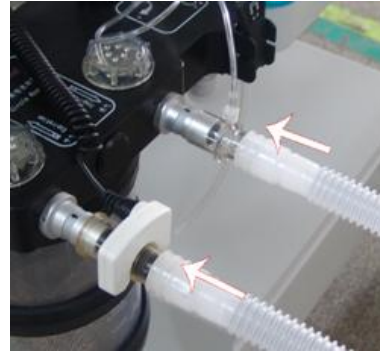


The other end of the cable conductor
was connected onto the flow sensor port
at the rear panel.



Step 6

Connect the breathing tubes.
Connect the two corrugated tubing onto inhalation and exhalation ports respectively.



The other ends of the two tubes were connected with Y-piece and L-piece, then mask. Note: if the breathing tubes is design for one use, the two tubes and the Y-piece are incorporated.









Step 7

The connection of the Manual subassembly:
First connect the short corrugated tubing with the Manual reservoir bag port. Then connect the adapter with the corrugated tubing and last connect the manual reservoir bag with the adapter.



5.4 Connecting Gas and Electricity

-  **WARNING:** IEC 60601-1-1 applies both for combination of items of medical electrical equipment and for combinations of at least one item of medical electrical equipment with one or more items of non-medical electrical equipment. Even if there is no functional connection between the individual pieces of equipment, when they are connected to an auxiliary mains socket outlet they constitute a medical electrical system. It is essential that operators are aware of the risks of increased leakage currents when equipment is connected to an auxiliary mains socket outlet.
-  **WARNING:** The equipment connected to the power outlet will increase electric current leakage. Test electric current leakage regularly.
-  **WARNING:** A malfunction of the central gas supply system may cause more than one or even all devices connected to it to stop their operation simultaneously.
-  **CAUTION:** Disconnect the anesthetic workstation from the gas supply after use to prevent contamination or pollution of the pipeline system.
-  **CAUTION:** Only the medical gas supply should be used. Other types of gas supply may contain water, oil or other pollutants.
-  **WARNING:** All connectors of gas supply have different dimensions and structures. It can avoid wrong operation occurs.

5.4.1 AC inlet

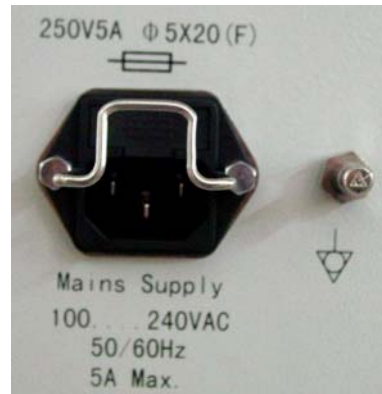
AC Power:

100 to 240VAC, 50/60Hz; 5A Max.

Fuse:

250V/5A, Φ 5X20 (F)

Clasp can stop power cord breaking off.



5.4.2 Auxiliary mains socket outlet

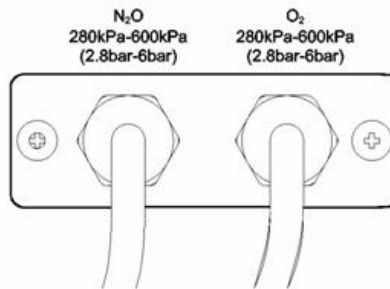
⚠ CAUTION Auxiliary mains socket outlets operator-accessible should be not more than four when in use Aeon7400A.

This label displays the voltage of the power supply and the rated ampere value of the circuit breaker.

Fuse: 250V 2A, Φ 5X20 (F)
Maximum current outlet: 1.5A (each); 3A (total)



5.4.3 Pipeline gas supply inlet



Pressure inlet: 280 to 600kPa
Pipeline connector: DISS (Diameter-indexed safety system).
It can prevent wrong connection generating.

5.4.4 Cylinder gas supply inlet



Cylinder connector: PISS (Pin-indexed safety system)
It can prevent wrong connection generating.

⚠ WARNING: The connecting procedures of O₂ and N₂O to the rear of the anesthesia system have been provided. Each has a different dimension to avoid wrong connection. A continuous pressure monitoring device is installed in the front of the anesthesia system to monitor each gas that connects with hospital supply pipelines.

5.5 Install gas cylinder (Test high pressure leak)

⚠ CAUTION: Do not turn the cylinder valve on when the pipeline gas supply is being used. The gas supply of the cylinder may be used out in case of pipeline failure so that the backup supply may be insufficient.

- 1 Turn the handle T of the cylinder valve clockwise until it is tight. Close the valve of the cylinder to be changed.



- 2 Release the yoke piece, then disassemble the cylinder.



- 3 Remove the valve cap from the new cylinder.
- 4 Keep the cylinder inlet away from all the objects which could be damaged by the release of high pressure gas.
- 5 To clear the cylinder valve of any debris, use the cylinder wrench to briefly open, then close the cylinder.
- 6 Install the cylinder.
 - Align index pin with the basic hole of the gas cylinder.
 - Close yoke piece and screw handle T.

7 Perform the high pressure leak test:

- Disconnect the pipeline gas supply.
- Close flowmeter.
- Open the cylinder.
- Close the cylinder.
- Record the pressure of the cylinder.
- If the pressure of the O₂ cylinder drops more than 5000 KPa after one minute, the high pressure circuit has an unacceptable leak.
- If the pressure of the N₂O cylinder drops more than 690 KPa after one minute, the high pressure circuit has an unacceptable leak.

Repairing gas leak

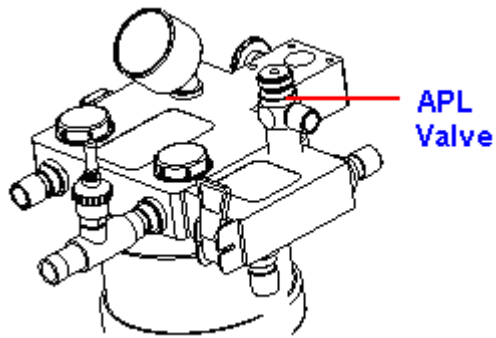
Install a fresh cylinder gasket and tighten the connector.

Repeat this step. Do not use this system in case of continuous gas leak.

5.6 Connect to AGSS

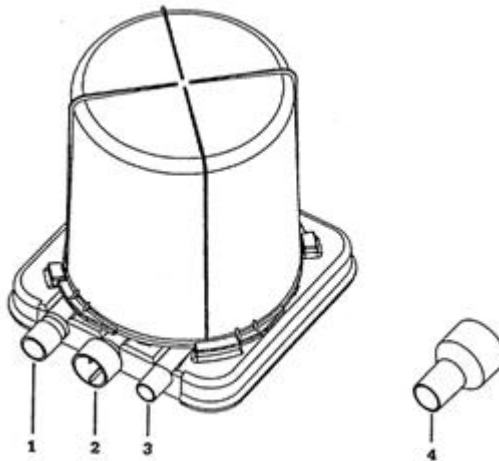
There are two ports releasing exhaust gas in this system. Connect the two ports to gas scavenging transfer and receiving system with tubes.

1. APL valve




2. Exhausting port of bellows assembly

See the following figure; number 2 is the exhausting port..



6 Cleaning and Disinfecting

 **WARNING:** Use a cleaning and disinfecting schedule that conforms to your institution's disinfection and risk-management policies.

- Refer to the material safety data policy of each agent.
- Refer to the operating and maintaining manual of all the disinfecting equipments.
- Do not inhale fume.

 **CAUTION:** To prevent damage:

- Refer to the data supplied by the manufacturer if there are any questions about the agent.
- Never use any organic, halogenate or oil base solvent, anesthetic, glass agent, acetone or other irritant agents.
- Never use any abrasive agent to clean any of the components (i.e. Steel wool, silver polish or agent).
- Keep liquids far from the electrical components.
- Prevent liquid from entering the equipment.
- Do not immerse the synthetic rubber components more than 15 minutes: any longer will cause inflation, or accelerating aging.
- Only the components marked 134°C are pressure-resistant and heat-resistant.
- The PH value of the cleaning solution must be from 7.0 to 10.5.

⚠ WARNING: Talc, zinc stearate, calcium carbonate, or corn starch that has been used to prevent tackiness could contaminate a patient's lung or esophagus, causing injury.

⚠ CAUTION: Never immerse the flow sensor in the liquid.

Do not clean the inner surface of the flow sensor. Clean the outer surface by using a damp cloth.

Check if there is damage in the components. Replace if necessary.

6.1 Cleaning and disinfection of pre-use first

Main unit	Clean the machine's panel and all surfaces with soft cloth soaked with the water soluble disinfecting agent.
	Sterilize main unit with ultraviolet radiation. Do not use acetic hycro peroxide or formaldehyde steaming.
Breathing system components	Refer to section 6.2
Absorber cycle	Washing, refer to section 6.4
Bellows assembly	Washing refer to section 6.5.4

6.2 Cleanable Breathing System Components

Corrugated tubing (contacted with patient), face mask, Y-piece connector, L-piece, reservoir bag	Designed for using only once, not need to sterilize. The waste should be recovered. When to replace these expendable, products with medical level and equal specification should be selected to use.
Corrugated tubing and bag (repetitious)	Washing to sterilize
T-piece	Washing to sterilize
Pressure sampling pipe	Clean with soap before use of each patient, and then washing in disinfecting solution after airing.


Components marked 134°C are pressure-resistant and heat-resistant and can be cleaned by hand or by machine (by using the mild agent with PH < 10.5). Scrub them thoroughly, then air out to dry.

Clean the bellows assembly by disassembling them, or they will take longer to dry. To dry, hang the bellows by from its top disk while spread fully. Moisture remaining in the folds of the bellows may make the bellows tacky.

Reassemble the bellows assembly prior to the hot-press disposal. Put the bellows assembly up side down when the hot-press disposal is being processed.

6.3 Absorber

Refer to “Disassembling the Absorber” in the section 5.2.2

 **WARNING:** The dry absorber may be very dangerous with the presence of any anesthetic. Take proper measures to avoid dry soda lime in the absorbent. Switch off all gas supplies after use.

6.3.1 Auto cleaning with agent or disinfectant

Clean the absorber in the agent or disinfectant according to the cleaning procedure.

Put the absorber in the heat-up room with the maximum temperature as 80°C or with the room temperature.

Higher-level disinfection is recommended if the agent and disinfectant cannot sterilize equipment.

6.3.2 Manual cleaning

Rinse the absorber.

Immerse the absorber completely in the sink with water and agent about three minutes at a temperature of 40°C.

Rinse the absorber.

Higher-level disinfection must be performed after cleaning by hand.

6.3.3 Advanced Sterilizing

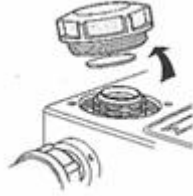
The absorber must be cleaned before advanced disinfecting.

The absorber can be placed in high temperature and high pressure conditions. The maximum temperature recommended is 134°C (273).

Put the soda lime into the absorber after being dried, and then tighten the knob. Clear all soda lime debris.

6.4 Absorber assembly

1 Inhalation valve and exhalation valve



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

2 Absorber module

Either vapouring (not more than 50°C) or immersion disinfection can be used in practice, in case of immersion all sterilized parts must be dried with the high pressure air or oxygen before reuse.

6.5 The Bellows Assembly

This section is about disassembling, assembling, cleaning and disinfecting the bellows assembly. Read all content of this section before disassembling, assembling, cleaning and disinfecting the bellows assembly to avoid equipment malfunction and patient injury.

 **CAUTION:** Only folding gasbag is made of latex.

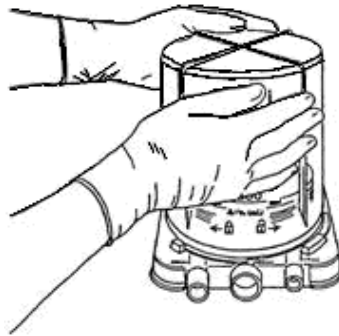
6.5.1 Disassembling

To disassemble the bellows assembly: (To assemble the bellows assembly, perform the steps in “Disassembling the bellows assembly” in reverse order):

- 1 Loosen the screws from the mounting plate, and then remove the bellows assembly.



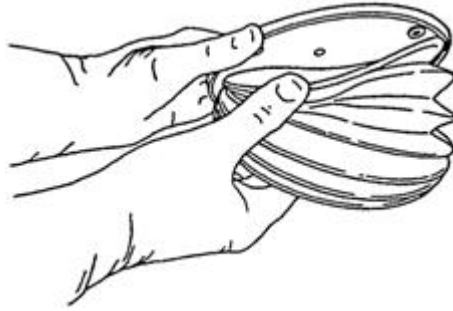
- 2 Turn counterclockwise and remove the bellows housing.



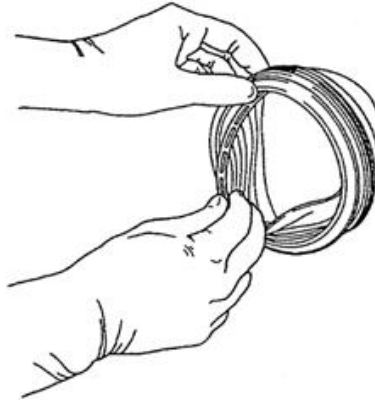
- 3 Detach the folding gasbag from the rim.



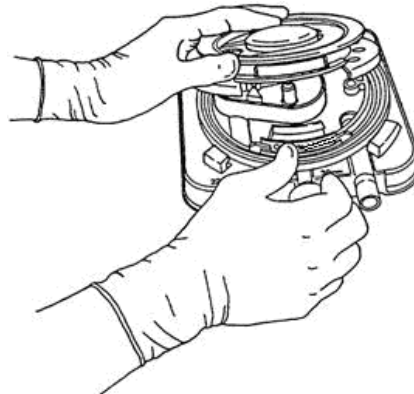
- 4 Detach the top plate from the folding gasbag.



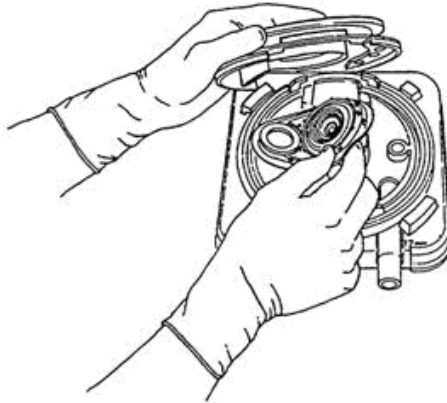
- 5 Remove inner ring from the top of folding gasbag.



- 6 Push the locking spring to the center, and then remove the rim.

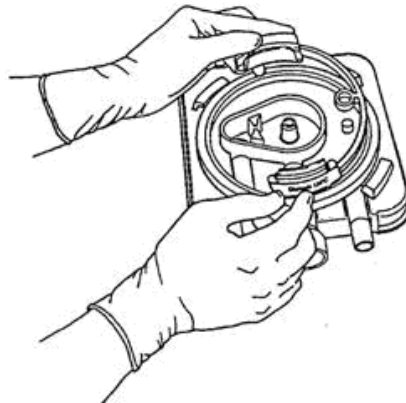


- 7 Remove the pressure-relief valve diaphragm and seat assembly.

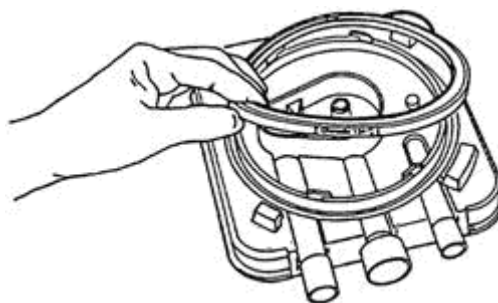


⚠ WARNING: Do not remove bellows assembly base from diaphragm of the pressure relief valve. This can distort the seat or diaphragm and cause injury to the patient.

- 8 Push to the center, then remove the locking spring.



- 9 Remove the seal.



6.5.2 Testing Function

⚠ WARNING: Do not use any object small enough to slip completely into the system when occluding the breathing system for test purposes.

⚠ WARNING: Always check the breathing system components for foreign objects before using on a patient.

This test is to ensure all the components are installed correctly. It cannot replace the system test. The bellows assembling can be installed in case they requirement testing. Otherwise, they need to be disassembled to check and replace broken components, then reassembled and tested.

Hold the bellows assembly in hands vertically upwards to occlude the driving gas port before installing.



Invert the bellows assembly. If the descending velocity of the bellows top is no more than 100 ml/min, this could be because the driving gas port is not properly sealed, bellows or seal is not installed correctly or other component are broken and that the descending velocity exceeds the limit.



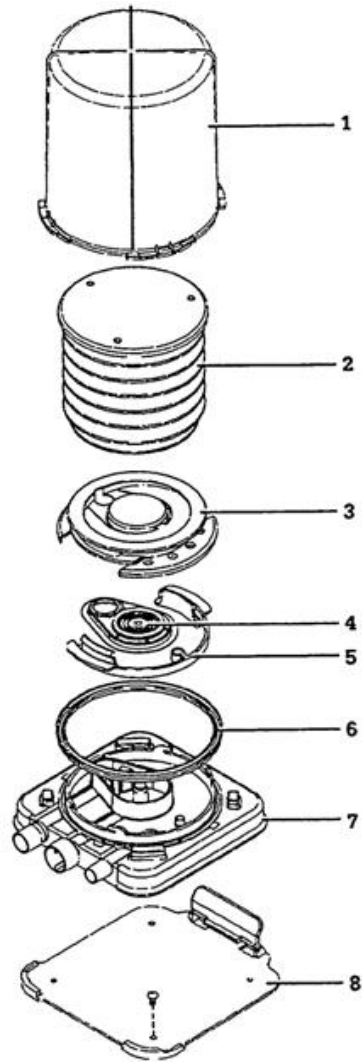
Open the driving gas port to make the bellows fully spread, and then occludes the breathing system connector.



Turn the bellows assembly so it faces vertically upwards. If the descending velocity of the bellows top is no more than 100 ml/min this could be because the bellows or pressure-relief valve is not installed correctly or other component are broken and the descending velocity exceeds the limit.



6.5.3 Bellows Assembly lists



Legend:


1. Bellows housing	5. Locking spring
2. Folding gasbag	6. Seal
3. Rim	7. Bellows base
4. Pressure-relief valve	8. Mounting plate

6.5.4 Cleaning and Disinfecting


Follow the machine and sterilizer manufacturer's cleaning recommendations.

1 Cleaning


1) Disassembling.

 **WARNING:** Never separate the diaphragm and the valve seat in a pressure-relief valve.

2) To prevent component damage, clean them lightly. Put the recommended nonenzyme mild agent used for latex and plastic in hot water.

 **CAUTION:** Do not immerse them more than 15 minutes to prevent inflation or aging.

3) Rinse using clean hot water, and then dry.

 **CAUTION:** Dry by hanging while fully spread. If moisture is left in the bellows, they may become tacky.

4) Check the components if they are broken or damp, then perform the assembling and function test.

5) Connect the bellow assembly, ventilator and breathing system.

6) Perform the preoperative check.

2 Sterilizing

Cleaning and disinfecting must be performed at the same time. Follow instructions for the common bellows assembly disinfection methods.

Sterilizing after general patient use:

Clean the inner and outer parts of the bellows assembly in a soap-and-water solution. Rinse thoroughly in cold water, and dry with soft cloth. Immerse plastic and latex instruments in 70-80% ethyl alcohol for half an hour. Take them out using the aseptically transmits pliers, then store in clean containers. Repeat this step before next use. Components made of metal and glass can be sterilized with high pressure steam. When the steam pressure is increased by the autoclave, the rising temperature can concrete the bacterium protein rapidly to kill bacteria. In 1.05 KG/CM² steam pressure, the temperature rises to 121C. All bacteria and most sorus can be killed if this temperature is maintained for 15-25 minutes.

Sterilizing after special infection or infectious patient use:


Open pulmonary TB, pulmonary abscess, pseudomonas, tetanus aeruginosa infection, gas gangrene or infectious hepatitis is included. Used bellows assembly components must be completely sterilized according to preliminary and final disposal procedures.

- 1) Preliminary disposal: Perform in accordance with the isolated disposal stipulation. Collect and leave all the used bellows assembly components during the operation process in the operating room. Immerse the bellows assembly components in the 1:1000 benzalkonium bromide or 1-5% cresol for 30 minutes after finishing the operation.

2) Final disposal: perform the final disinfecting disposal after the bellows assembly components are processed by the above-mentioned preliminary disposal:

- Scrub the bellows assembly in a soap-and-water solution. Thoroughly rinse in cold water, and dry;
- If conditions permit, suffocating the components directly contacted with patients with formald or oxirane is preferred, or perform immersing disinfection respectively. For example: the components used by open pulmonary TB patients must be immersed in 3% cresol for 30 minutes; the components used by tetanus aeruginosa infection patients must be immersed in 0.2% potassium permanganate for 30 minutes; the components used by gas gangrene patients must be immersed in 0.1% chlorhexidine for 30 minutes; the components used by pulmonary abscess patients must be immersed in 0.1% benzalkonium bromide for 60 minutes; the components used by pseudomonas patients must be immersed in 0.1% benzalkonium bromide for 120 minutes;
- the components being immersed need to be rinsed by water and dried for next use;
- scrub and rinse the components indirectly contacted with patients with 1-3% phenol solution or soap-and-water solution and water. Irradiate them by using the ultraviolet ray for 30 minutes if necessary.


6.5.5 Regular Maintenance

 **WARNING:** Do not perform any tests and repairs when the equipment is being used to avoid patient injury.

Perform the following check every 30 days to be sure that component worn by use and daily cleaning are replaced in time.

Test by eyes


Separate the bellows assembly and anesthesia machine
Disassemble the bellows assembly


 **WARNING:** Never separate the diaphragm and the valve seat in a pressure-relief valve


Check each component carefully to check for cracks, distortion, dissolution, inflation and other physical changes. Replace them if necessary.


Assemble the bellows assembly, and then perform the leak test.


7 User Maintenance

-  **WARNING:** To avoid fire:
- Use the lubricant approved for anesthesia or O₂ equipments' use.
 - Never oil or grease any anesthesia or O₂ equipment. In general, oils and greases oxidize readily, and – the presence of O₂ – are highly flammable.
 - All the covers or housings for the system use must be made of static proof material, as static material may cause fire.

 **WARNING:** Follow disinfecting control and security stipulations because used equipment may contain blood and body fluids.

 **WARNING:** Movable components and detachable parts can cause injury. Use caution when system components and parts are being moved or replaced.


 **WARNING:** No shock and strong vibration should happen during transportation because the glass cover of flowmeter is fragile.

 **WARNING:** Disposal of waste or invalidated apparatus must be in accordance with the relevant policies in local government.

7.1 Repair Policy

Do not use malfunctioning equipment. Make all necessary repairs, or have the equipment serviced by an authorized Aeonmed Service Representative. After repair, test the equipment to ensure that it is functioning properly, in accordance with the manufacturer's published specifications.

To ensure full reliability, have all repairs and service done by an authorized Aeonmed Representative. If this is not possible, replacement and maintenance of parts in this manual should be performed by a competent, trained individual with experience in Anesthesia Systems repair, and appropriate testing and calibration equipment.

 **CAUTION:** No repair should ever be undertaken or attempted by anyone without proper qualifications and equipment.

It is recommended that you replace damaged parts with components manufactured or sold by Aeonmed. After any repair work, test the unit to ensure it complies with the manufacturer's published specifications.

Contact the nearest Aeonmed Service Center for service assistance. In all cases, other than where Aeonmed's warranty is applicable, repairs will be made at Aeonmed's current list price for the replacement part(s) plus a reasonable labor charge.

7.2 Maintaining Outline and Schedule

The following schedule is a recommended minimum standard based upon normal usage and environmental conditions. Frequency of maintenance for the equipment should be higher if your actual schedule is more than the minimum standard.


7.2.1 User maintenance

Minimum Standard	maintaining	Planned maintaining Standard
Daily		Clean the outer surface.
weekly		Ventilate the system, open flowmeter, and make sure that the float move up and down smoothly. It can prevent blocking and clinging.
monthly		Test leakage of bellows assembly. (refer to section 6.5.2)
When cleaning and installing		Check if any components are broken, and replace or repair them if necessary.
As required		Replace new gasket of cylinder gas supply. Open the drain valve and replace absorbent in the absorber.

7.2.2 Permissive Repairing

Minimum Standard	maintaining	Planned maintaining Standard
6 months		Test electric current leakage.
6 months		Test mechanical safety valve.
12 months		Perform the maintenance, checking, testing, calibrating and replacing of the components stipulated in this manual by qualified individuals. Notes: This is the recommended minimum maintaining level. Perform the local policies if they are equal to or higher than those in this manual.

7.2.3 Useful life estimation

 **CAUTION:** The useful life of the following parts should be considered in normal environment and operating requirements.

Pressure sampling pipe	1500 times
Corrugated tubing used repetitious	Not less than 1 year
Power cord, sampling line of flow sensor	8 years
Bellows assembly (except bellows)	1500 times
Drain valve	5000 times
Pipelines, T-piece	8 years
Main unit	8 years

7.3 Maintaining the Breathing System

Parts that are broken, crushed, worn or distorted must be replaced immediately when cleaning the breathing system.

Refer to the sections corresponding to reassembly and testing.

7.4 Maintaining flow sensor

Perform the calibration periodically, interval refer to section 7.2.1.

7.5 Replacing fuses

⚠ WARNING: Disconnect from power supply before replacing fuses, otherwise that can injure operator even death.

⚠ WARNING: Replace fuses with only those of the specified type and current rating, otherwise that can damage the equipment.

⚠ CAUTION: The fuse is fragile, so replacement should be carefully. Do not use excessive force.

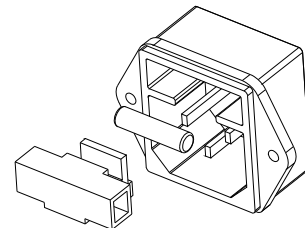
7.5.1 Replacing fuse of mains supply

The location of fuse as shown in the following figure with arrow pointed up.



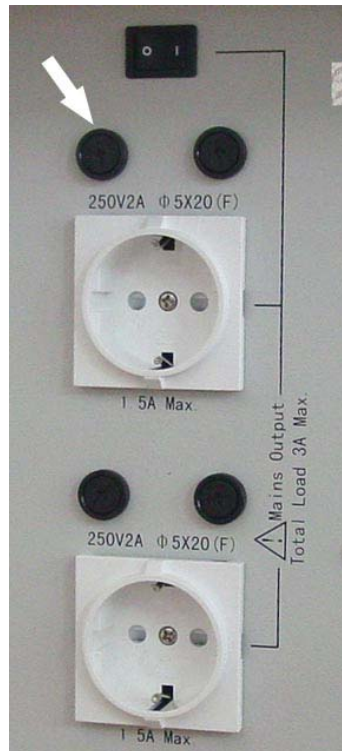
Replacing steps:

- 1 Insert the screwdriver into the groove on the top of fuse box.
- 2 Prize up gently.
- 3 The cover of fuse box springs lightly.
- 4 Take off the cover.
- 5 Take out fuses.
- 6 Enclose the new ones.
- 7 Push the cover to original place.
- 8 Connect mains supply.



7.5.2 Replacing fuse of auxiliary mains socket outlets

The specification is shown in the following figure.



7.5.3 Replacing fuse of the ventilator

The location of the fuse is in the rear panel of the machine, see Figure 2-2.

Replacing steps of 7.5.2 and 7.5.3:

- 1 Plug the screwdriver to groove on the end of fuse box.
- 2 Turn counterclockwise 3~5 circles then pull out fuse tubes lightly.
- 3 Take off fuse tubes.
- 4 Enclose the new ones.
- 5 Push fuse tubes to original place gently.
- 6 Turn clockwise 3~5 circles with screwdriver to tighten.
- 7 Connect mains supply.

8 Alarm and Troubleshooting

⚠ WARNING: No repair should ever be undertaken or attempted by anyone without proper qualifications and equipment.

8.1 About alarm

⚠ CAUTION: If alarm occurs, protect patient safe firstly, and then go to diagnose fault or service it necessarily.

⚠ CAUTION: Operation instruction is not included in the alarm message list.

Message	Alarm kind	Condition	Operator Action
AC Power lost	Audible alarm	Connection failure; Power failure.	Check connection; Check mains supply; Check fuses.
High Paw	Audible and visual alarm	Paw greater than high limit. Settings of V_T higher. Patient airway blocked. Exhalation valve blocked.	Reset upper limit of Paw. Check expiratory cycle, and dispose block existed. Check V_T settings. Check airway of patient, and dispose block existed.
Low Paw	Audible and visual alarm	No driving gas. Pressure sampling pipe fall off or blocked. Respiratory frequency lower.	Reset lower limit of Paw; Check the pressure sampling pipe.
Oxygen pressure low	Audible alarm	Oxygen pressure is lower than 0.2MPa.	Check the oxygen connection.

8.2 Troubleshooting

8.2.1 Anesthesia machine

Symptom	Possible Cause	Recommended Action
Patient breathing circuit gas leak	APL valve is on	Turn APL valve to off
	soda lime in the cylinder port is not sealed very well	Reinstall or remove the sodium calcareousness grains at the joint.
	Screw tubes are broken or the connector loosens	Replace or reinstall
	valves loosen	Tighten them
	Bag / Ventilator switch failure	Please contact eligible service representative.
Excessive pressure caused by manual ventilation	APL valve is adjusted incorrectly	Adjust it properly
Switch to bag control, bellows charging; switch to ventilator control, bag charging.	Leakage occurs at bag / ventilator switch.	Please contact eligible service representative.
APL valve doesn't work normally	APL valve failure	Please contact eligible service representative.

8.2.2 Anesthetic Ventilator

Symptom	Possible Cause	Recommended Action
The digital tube has no power, and ventilator does not work	Power supply cable is unplugged; Power switch is off; Fuse is burned.	Plug in power supply cable; Turn on power switch; Replace with a new one.
Ventilator stops operating suddenly, indicator light turns off, and sounds alarm	Power supply is interrupted.	Use manual ventilation.
Maximum pressure alarm sounds continuously	Patient circuit is occluded; Patient's respiratory tract is occluded; Maximum pressure setting is too low; Ventilator parameters changed.	Check and adjust patient circuit; Check the patient; Readjust the alarm setting Recalculate the ventilator parameter.
Minimum pressure alarm sounds continuously	Patient circuit leaks; Alarm settings is too high; Patient's compliance changes; Pressure sampling pipe is disconnected or broken.	Check and adjust patient circuit; Reset the alarm settings; Check the patient; Check the pressure sampling pipe.
No indication from the airway pressure gauge	Pressure sampling pipe is disconnected; Gas supply exhausted.	Reconnect the pressure sampling pipe; Replace the gas supply.
Tidal volume readings does not display normally	Flow sensor is unplugged; The inner and outer O rings of bellows base are broken; Folding gasbag is broken; Pressure-relief valve is broken.	Plug in the flow sensor; Check the bellows and replace the broken parts, then reassemble it and carry out testing procedure according to section 6.5.2.

<p>The folding gasbag is inflated excessively</p>	<p>Gas scavenging port is occluded; Malfunctioning waste gas scavenging system creates excessive resistance or vacuum.</p>	<p>Remove the occlusion; Repair waste gas scavenging system.</p>
<p>The folding gasbag does not expand during ventilation or tends to collapse</p>	<p>Breathing circuit is disconnected; Bellows base is broken; Tear or leak in the bellows; Exhalation diaphragm is broken; O rings are broken.</p>	<p>Check and reconnect breathing circuit; Check and replace a bellows base; Check and replace a bellows; Check and replace an exhalation diaphragm; Check and replace O rings.</p>

9 Ordering information

9.1 Key components

Description	Code Name	Specification	Stock Number
Anesthetic Ventilator	MV200B	----	121000052
Bellows Assembly	BA100	Adult use	121000001
	BA150	Pediatric (optional)	121000030
Absorber Circuit (i.e. Circle Absorber)	AC100	Standard configuration	121000012
	AC110	Optional	121000046
Flowmeters	FM220	European version	121000006
	FM270	USA version	121000071
Vaporizers	VP300	Enflurane, (optional)	121000018
	VP300	Isoflurane, (optional)	121000057
	VP300	Halothane, (optional)	121000058
	VP300	Sevoflurane, (optional)	121000059
Yoke system	----	Optional	122000101
Cylinder assembly system	CS100	Including yoke system and cylinders; (optional)	121000002

9.2 Bellows Parts List

Description	Belong to	Stock Number
Bellows housing	BA100	130000359
	BA150	130002028
Top plate	BA100	130000361
	BA150	130002032
Buffer cushion	BA100	130000360
Inner ring	BA100	130000362
Folding gasbag	BA100	130000358
	BA150	130002029
Adapter (inside)	BA150	130002030
Sealing element	BA150	130002031
Rim	Both	130000363
Pressure-relief valve diaphragm	Both	130000357
Pressure-relief valve plate	Both	130000356
Locking spring	Both	130000364
Seal	Both	130000355
Base	Both	130000354
Mounting plate	Both	122000061
Adapter (outside)	Both	130000450

9.3 Accessories

Description	Specification	Stock Number
O ₂ pipeline	5m, white; European version	122000048
	5m, green; USA version	122000957
N ₂ O pipeline	5m, blue; European and USA version	122000049
Power cord	5m; European version, 250V/10A	210000170
	4m; USA version, 250V/10A	210000187
	3m; British version, 250V/10A	210000188
	5m; China version, 250V/10A	210000189
Ground wire	3.5m, yellow-green	210000146
Pressure sampling pipe	1.1m, colorless and transparent	230000084
pressure sampling connector (i.e. T-piece)	Outer cone: $\Phi 22$; inner cone: $\Phi 22$	230000093
Turbine sensor	Precision instrument	240000066
Flow sensor assembly	Including turbine sensor, flow sensor PCB, and white detector assembly.	122000028
O ₂ cylinder	Capacity: 4L; white; (optional)	220000037
N ₂ O cylinder	Capacity: 4L; blue; (optional)	220000038
Castor	$\Phi 100$ mm; no break, (mounted)	240000037
	$\Phi 100$ mm; with break, (mounted)	240000038
Cover	Keep dust away and avoid direct light.	230000292
User Manual	Instruction for use	130002324

9.4 Expendable parts

Description	Specification	Stock Number
Anesthetic circuit (i.e. anesthesia circuit)	Single use; Adult use	230000312
Respiratory circuit	Pediatric use, (optional)	240000028
Corrugated tubing (i.e. threaded pipe)	Φ22×600mm, Silica Gel, light green	230000313
	Φ17×600mm, Silica Gel, light green	230000318
	Φ22×300mm, Silica Gel, light green	230000315
Reservoir bag	Capacity: 3L; black	230000075
Face mask	Adult	230000311
	Pediatric use, (optional)	230000066
Pipe clip (i.e. clamp clip)	Fixing corrugated tubing and pressure sampling pipe	130002812
Fuse	250V/0.5A, Φ5×20(T)	210000173
	250V/2A, Φ5×20(F)	210000208
	250V/5A, Φ5×20(F)	210000174
Plug	Use for plugging up the holes of support arm.	130000167

10 Specifications and Operation Theory

10.1 Schematic diagram

See Figure 10-1

1. N₂O cylinder (optional)
2. N₂O pipeline
3. O₂ cylinder (optional)
4. O₂ pipeline
5. Pressure gauge
6. At most two cylinders
7. Cylinder gas supply:
input (2.5~12MPa)
8. O₂ reducing valve
9. Gas reservoir
10. Whistle
11. N₂O cut-off valve (0.02~0.2MPa)
12. O₂ primary pressure regulator
(0.4MPa)
13. Solenoid valve
14. Silencer
15. Atmosphere
16. Venturi
17. Flow control valve
18. O₂ secondary pressure regulator
(0.25MPa)
19. Safety valve
20. Pressure-relief valve
21. Exhaust valve
22. Bellows
23. Manual/IPPV change valve
24. Manual reservoir bag
25. APL valve
26. Flow meter
27. Vaporizer
28. O₂ flush
29. Micro-checkvalve
30. Fresh gas outlet
31. Absorber
32. Airway pressure gauge
33. Expiratory valve
34. Inspiratory valve
35. Turbo flow sensor
36. Pressure sensor
37. Patient
38. Outdoor atmosphere
39. Power cord
40. Alternating current inlet with
fuse and filter
41. Switching power supply
42. Ventilator panel
43. Display panel
44. Keyboard
45. Buzzer

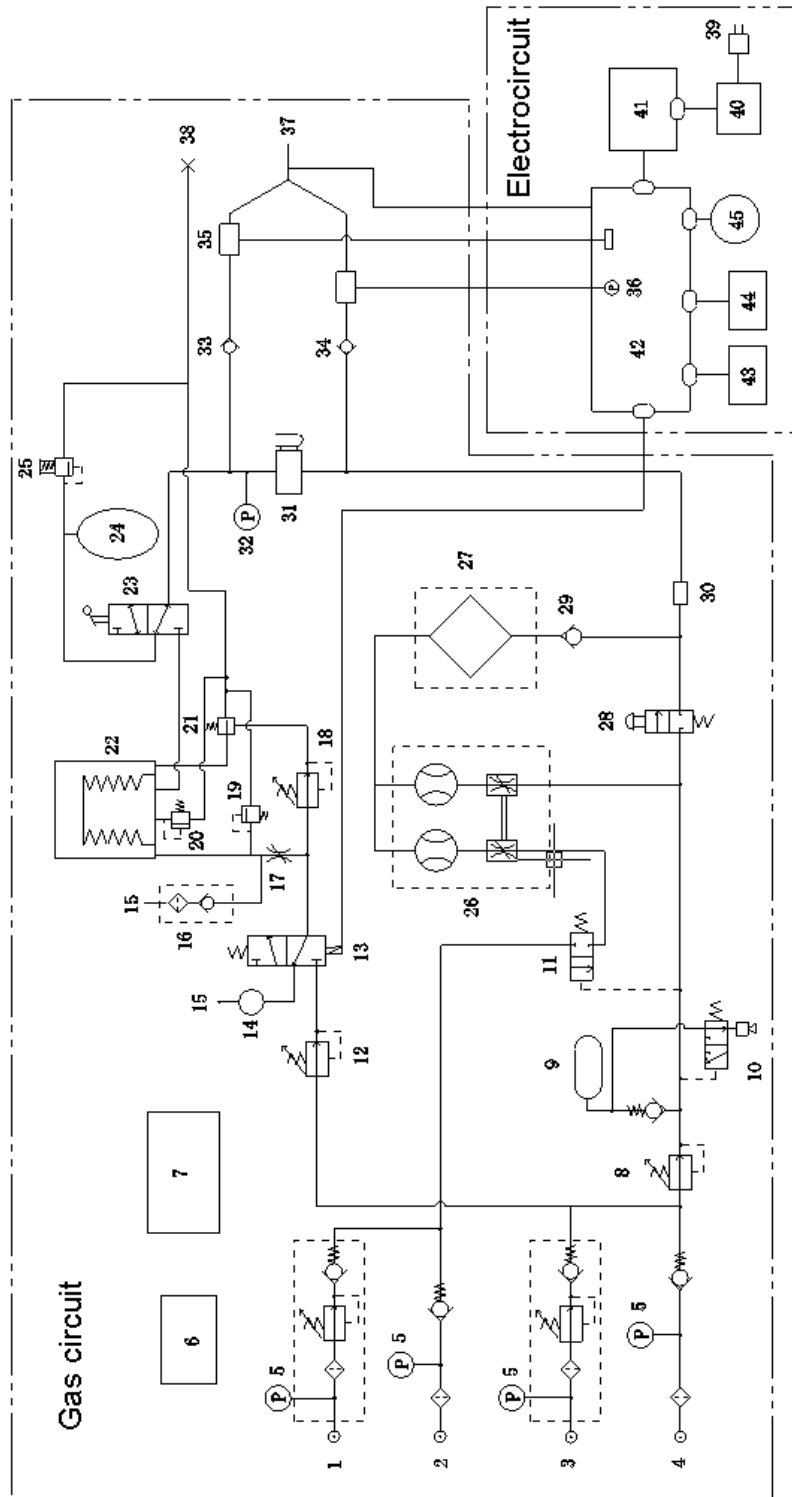


Figure 10-1 Schematic diagram of Aeon7400A system principle


10.2 System technical specification

10.2.1 Drive

Gas supply:

Pipeline Supply:	O ₂ , N ₂ O
Cylinder Supply:	O ₂ , N ₂ O
Connect to cylinder:	PISS (pin-indexed safety system)
Reducer:	400kPa
Connect to pipeline:	DISS-male, DISS-female, NIST (ISO 5359) All fittings used to connect O ₂ and N ₂ O pipeline gas supply are all ready.
Display pressure:	Gauges with color coded
Input pressure at pipeline inlets:	280~600kPa
Input pressure at cylinder inlets:	2.5~2MPa

 **WARNING:** All gas supplies must be in accordance with medical level.

 **CAUTION:** Pressure at pipeline inlets must be according to 280~600kPa when delivering ceases in the anesthetic gas delivering system.

Medical gas color codes:

	China standard	European standard	USA standard
Oxygen:	Blue	White	Green
Nitrous oxide:	Grey	Blue	Blue
Air:	Black	White/Black	Yellow

10.2.2 Flow

Gas component	Scale (thin tube)	Scale (thick tube)
O ₂	0.05~1L/min	1.1~10L/min
N ₂ O	0.05~1L/min	1.1~10L/min

Accuracy: With regard to the flow between $\pm 10\%$ of full scale or 300ml/min (higher is preferred) and full scale under the condition of 20C, 101.3kPa, flow meter precision is within the $\pm 10\%$ of indicated values. The precision is 4 degree when the flow is lower than 10% of full scale or 300ml/min (higher is preferred).

Adjust O₂ and Nitrous oxide proportionally to ensure the O₂ concentration is no less than 25%.

O₂ flush: 35~75L/min

O₂ failure alarm and the associate cut-off device

	O ₂ pressure
O ₂ failure alarm:	50~220kPa
N ₂ O cut-off:	20~200kPa



CAUTION: O₂ failure alarm takes precedence of N₂O cut-off.

10.2.3 Classification

According to IEC 60601-1, Aeon7400A belongs to the following classifications:

- Class I equipment
- Type B equipment
- General equipment
- Mobile equipment
- Flammable anesthetic cannot be used
- Operate continuously

10.3 Power supply

Voltage:	100-240VAC, 50/60Hz
Input power:	Not more than 50 VA
Maximum input current:	5 A
Fuse at mains supply inlet:	250V 5A, Φ 5X20 (F)
Fuse above auxiliary mains socket outlets	250V 2A, Φ 5X20 (F)
Fuse on the rear panel of the ventilator	250V 0.5A, Φ 5X20 (T)
Maximum output current of auxiliary mains socket outlets:	1.5A (each); 3A (total)
Earth resistance:	<0.2 Ω



WARNING: Then connection of equipment to the auxiliary mains socket outlets can increase the patient leakage currents to values exceeding the allowable limits in the event of a defective protective earth conductor.

10.4 Electromagnetic Compatibility

Changing or reassembling this equipment without Aeonmed's authorization may cause electromagnetic compatibility problems. Contact with Aeonmed for assistance. Designing and testing this equipment is in accordance with the following stipulations.



WARNING: Using cell phone or other radio radiant equipment near this product may cause malfunction. Closely monitor the working condition of this equipment if there is any radio radiant supply nearby.

Using other electrical equipment in this system or nearby may cause interference. Check if the equipment works normally in these conditions before using on a patient.

Be careful of the following when Aeon7200A is connected:

Do not put any object which is not in accordance with EN 60601-1 in the 1.5M range of patients.


An isolated transformer must be used for alternating current supply (in accordance with IEC60989), or additional protective ground wires are equipped if all the devices (for medical or non-medical use) are connected to Aeon7200A by using signal input/signal output cable.

If a portable all-purpose outlet is used as the alternating current supply, it must be in accordance with EN 60601-1-1 and cannot be put on the floor. Using another portable all-purpose outlet is not recommended.

Do not connect the non-medical equipment directly to the alternating current outlet on the wall. Only the alternating current supply of the isolated transformer can be used. Otherwise, the surface leaking current may exceed the range permitted by EN 60601-1 under the normal conditions, and misoperation may cause injury to patients or operators.

Aeon7200A is equipped with all-purpose alternating current outlet for connecting other medical equipments. Do not connect non-medical equipment to these outlets. Otherwise, the surface leaking current may exceed the range permitted by EN 60601-1 under normal conditions and misoperation may be dangerous to patients or operators.

A complete system current leaking test (according to EN 60601-1) must be performed after any equipment is connected to these outlets.

 **WARNING:** Medical electrical equipment operators contact non-medical electrical equipment and patients at same time. It is dangerous of patients or operators.

10.5 Physical specification

All specifications are approximately, maybe changed at any moment without notice.

 **CAUTION:** Do not put Aeon7400A into the shock environment.

 **CAUTION:** Do not lay the heavy on the top or into the draws.

System	Dimensions	1350mm(H)×720mm(W)×990mm(D)
	Weight:	About 80kg
Castor	100mm, with breakers on the front castors.	
Cylinder gauge	Scale: 0~25MPa. Resolution: 1MPa. Accuracy: ±2.5% of full scale.	
Pipeline gauge	Scale: 0~1MPa. Resolution: 50kPa. Accuracy: ±2.5% of full scale.	
Airway gauge	Scale: -2~10kPa. Resolution: 200Pa. Accuracy: ±2.5% of full scale.	

10.6 Environment requirements

Temperature	Operation:	5~40°C
	Storage:	-10~55°C
Relative Humidity	Operation:	Not more than 80%, non-condensing
	Storage:	Not more than 93%, non-condensing
Atmospheric pressure	Operation:	96~104kPa
	Storage:	86~106kPa
Height	Operation:	500~800mmHg (3565~440m)
	Storage:	375~800mmHg (5860~440m)

10.7 Breathing system technical specifications

Compensation of fresh gas	Flow compensation range: 0 to 10L/min Gas components: O ₂ , N ₂ O, anesthetic agent
Absorbent	Capacity: 1500 ml (each)
Connection	Common Gas Outlet: ISO 5356 connector
Leakage of breathing system	At pressure of 3kPa: Leakage of flow: ≤150 ml/min
Resistance of breathing system	At flow of 60L/min: Resistance of exhalation: ≤0.6kPa; Resistance of inhalation: ≤0.6kPa. At flow of 30L/min: Resistance of exhalation: 2.3kPa; Resistance of inhalation: 2.3kPa. Patient cycle of small resistance should be used in accordance with the relevant standard.
Resistance of APL valve	At flow of 60L/min, resistance of flow: 0.05~3kPa; At flow of 30L/min, resistance of flow: 0.1~0.5kPa.
Leakage of connector	Resistance of flow: ≤50 ml/min. (APL valve close fully)
Resistance of checkvalve	Dryness: ≤0.15kPa
The pressure generated by a wet unidirectional valve: <0.14kPa; The pressure to open a wet unidirectional valve: <0.1kPa	
Compliance of absorber	<50mL/kPa

10.7.1 Performance of ventilator

Input Power	Not more than 50VA
Maximum security pressure of airway system	Not more than 6kPa
Compliance:	Not more than 40mL/kPa
Electrical safety:	Meet requirements for Class I, type B equipment specified in EN60601-1 <i>Medical Electrical equipment: Part one: General requirement for safety.</i>
Noise of whole unit:	Not more than 65dB(A)

10.7.2 Setting ventilation mode

Ventilation mode	Adjustable respiratory parameters
IPPV mode	V_T , f, I:E
Manual mode	----

10.7.3 Setting ventilating parameters

Item	Range
V_T	0~1500mL
f	6~60bpm
I:E	2:1, 1:1, 2:3, 1:2, 1:3, 1:4

10.7.4 Gas dynamics performance

Gas source:	Anesthetic system
Gas component:	O ₂
Rating pressure:	250kPa
Input pressure range:	280~600kPa
Flow valve range:	5~75L/min
Output:	Pressure range: 0~6kPa; flow range: 0~75L/min

10.7.5 Setting alarm parameters

Item	Limit	Range
Paw (airway pressure)	Low	0~2kPa
	high	2~6kPa

⚠ CAUTION: All low limits of parameters in above table may not be set up the high limits, nor may the high limits be set below the low limits.

10.7.6 Volume and pressure

Type of flow sensor	Honeywell-DC002NDC4 / DC004BDA4 (Pressure difference)
Type of pressure sensor	Motorola MPX2010

10.7.7 Monitoring performance

Item	Range	Resolution	Accuracy
V_T	0~1500mL	1mL	$\pm 40\text{mL}$ (below 200mL); $\pm 15\%$ (other)
P_{aw}	-2~10kPa	----	----

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