S6600 Anesthesia System
Operation Manual

Nanjing Superstar Medical Equipment Co., Ltd.

Contents

User's responsibility

- Read the operation manual carefully and assemble, operate and maintain in strict accordance with instructions in this manual.
- Performance of safety for the equipment shall be checked before the equipment is started each time so as to ensure that the equipment is in sound operation condition in service. Please refer to "Pre-use check" section in this operation manual.
- The equipment is to be operated by trained and authorized medical personnel only.
- Parts which are damaged, missing, wearing, deformed or polluted, should be replaced immediately. If need to repair or replace, we recommend that you call or write to the recent company's customer service center for help.
- Don't make any change for the equipment unless authorized by our company. If any trouble occurred with the equipment, service shall be made by special technical personnel authorized by our Company or by trained and qualified technical personnel.
- If improper use, wrong maintenance and repairing, damage or changes made by any person not in our company lead to product faults, the responsibility will be taken by users.
- If necessary, please contact our company for further information.
- Keep the machine stable and balance during operation, transportation or move. The maximum tilt angle is not more than 10°.

⚠ **Warning:**

- Never use inflammable or explosive drugs with this equipment!
- The vaporizer only shall be filled with specified drugs. Never mix them up!
- Only vaporizers provided or designated by Anesthesia system manufacturer that are in match with the Anesthesia system shall be used. Otherwise, their performance will be degraded.
- Don't use antistatic breathing tube (threaded pipe) and mask with this equipment. If this kind of breathing tube (threaded pipe) and mask are used adjacent to HF electrical surgical equipment, it will lead to fire.
- The equipment shall not be used in a hazardous environment containing inflammable and explosive gases.
- The equipment shall not be used in the Nuclear Magnetic Resonance environment.
- When any alarm conditions occurred during operation, the equipment shall be checked and trouble be removed immediately.
- If alarm occurs in use, please ensure patient's safety at first, then carry out fault diagnosis or necessary maintenance.
- If power supply is interrupted, manual vent should be immediately carried out.
- Although full consideration is given to clinic safety in the design of this equipment, its operator still shall not neglect the observation of operation conditions of the equipment and monitoring of patient. Only by so doing, any mistakes or functional abnormal may get corrected right away once occurred.
- Breathing tube (threaded tube) shall be placed carefully so as not to enwind or asphyxiate the patient during operation.
- Moving or covering the equipment is not allowed during operation; nor is servicing of the equipment allowed. Do not maintain the machine during operation.
- When N_2O is used, its O_2 concentration shall not be less than 25%.
- To avoid risk of electric shock, this equipment must only be connected to a supply mains with protective earth.
- All parts of the ventilator must not be serviced or maintained while in use with the patient.
- No modification of this machine is allowed.
- Do regular check (Refer to the chapter of maintenance) and replacement (Refer to of replacing of the back-up battery) of the battery.

Symbols used in this manual or on this equipment

"⚠" indicates that accompanying documents shall be consulted.

"⚠**Warning**" and "⚠**Caution**" indicate that dangerous conditions can occur if operation is not carried out as instructed in this operator's manual. Please read the manual carefully and pay attention to all warnings and cautions.

Warning: indicates that if operation is not carried out as instructed, injury to you or your patient and/or damage to the equipment can occur.

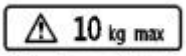
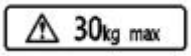
Caution: means there is a possibility of damage to the equipment or other property.

Note: indicates points of particular interest for more efficient and convenient operation.

Other symbols are used in this manual or on the equipment in order to replace words expressions. These symbols are included in the following Table A1.

Table A1 – Explanation for symbols used in this manual or on the equipment

Graphs & Symbols	Instructions
	Follow instructions for use
~	Alternating current
	Standby
	Type B applied part
	Gas inlet
	Manual ventilation
	Battery state indicator
	Battery
	Mechanical control ventilation
APL ⚠≈cmH2O	APL valve
O_2+	Oxygen flush valve
⚠ ACGO	ACGO On
	ACGO Off
	Lock
	Unlock
—MAX—	Maximum capacity scale line

Graphs & Symbols	Instructions
	Switch on/off key
	Enter key
	Left selection operation key
	Right selection operation key
	Knob adjustment
	Caution hot
O_2%	Oxygen sensor connection port
	Central gas supply
	Cylinder gas supply
ISP	Upgrade interface for monitoring board
RS232	Nurse calling interface
VCM-Cal.	Calibration interface
FLOW-Cal.	Electronic flowmeter calibration interface
	Network interface
	Equipotential terminal
	AG/CO_2 Module interface
	Limited weight mark
	Limited weight mark
	Exhaust port
≈	Approximate
	Manufacturer
SN	Serial number
	Audio Paused
	Alarm setting

Graphs & Symbols	Instructions
	Backup battery supply indication
	indication for low voltage of battery
	Battery charging (main power is supplying) indication
	Backup battery failure
	Protective earth
	Lock Soda Lime tank device
	Open Soda Lime tank device
	According to the direction of the arrow to unlock or lock
134°C	High temperature steam sterilizing
******	Please enter 6 digital password
****	Please enter 4 digital password
! ! !	High priority alarm
! !	Medium priority alarm
!	Low priority alarm
	Castor lock state
	Castor unlock state
	Top lamp switch
	Symbol for the marking of electrical and electronics devices according to Directive 2002/96/EC. The device, accessories and the packaging have to be disposed of waste correctly at the end of the usage. Please follow Local Ordinances or Regulations for disposal.

Terms and abbreviation in this manual or on this equipment：

Terms and Abbreviation	Explanation
Fi	Inhalation
Et	Exhalation
FiO_2	O_2 concentration of inhalation
EtO_2	O_2 concentration of exhalation
FiN_2O	N_2O concentration of inhalation
EtN_2O	N_2O concentration of exhalation
FiAA	Anesthetic concentration of inhalation
EtAA	Anesthetic concentration of exhalation
MAC	Minimum alveolar concentration
Paw	Airway pressure
Ppeak	Airway peak pressure
Pplat	Platform pressure
Pmean	Mean pressure
PEEP	Positive end-expiratory pressure
Vte	Expiration tidal volume
Vti	Inspiration tidal volume
MVe	Expiration minute volume
MVi	Inspiration minute volume
Freq	Frequency
PIF	Inspiratory phase flow
PEF	Expiratory phase flow
$EtCO_2$	CO_2 concentration of exhalation
$FiCO_2$	CO_2 concentration of inhalation
awRR	Airway respiratory rate
I：E	Inhalation/exhalation ratio
Raw	Airway resistance
Cydn	Dynamic lung compliance
V-CMV	Volume control ventilation
V-SIMV	Synchronized intermittent mandatory ventilation-volume controlled ventilation
P-CMV	Pressure control ventilation
P-SIMV	Synchronized intermittent mandatory ventilation - pressure control ventilation
PSV	Pressure support ventilation

PRVC	Pressure regulated volume control ventilation
Man/Spont	Manual ventilation/ autonomous respiration
SEV	Sevoflurane
DES	Desflurane
HAL	Halothane
ENF	Enflurane
AA	Anesthetic
APL	Adjustable pressure limit
ACGO	Auxiliary common gas outlet
Bpm	Beat per minute （unit for frequency）
S	Second （Unit for time）
mL	milliliter（Unit for capability）
L	Liter（Unit for capability）
L/min or lpm	Liter per minute（Unit for volume）
PSI	Unit for pressure
kPa	Unit for pressure
cmH2O	Unit for pressure

Intended use

Anesthesia System is intended to provide general Anaesthesia to the patients as well as control patient's breathing or assist breathing, monitor and display ventilation parameters of patients in medical department. It applies to adults and children aged 3 years old and above.

Adaption disease

Patients in need of Anaesthesia surgery.

Contraindication

As to the Anesthesia System there is no absolute contraindication. But the operator should pay attention to the relevant contraindication of mechanical ventilation.

EMC Information

⚠Important Notice

- S6600 Anesthesia System meets the requirement of electromagnetic compatibility in IEC60601-1-2.
- The user needs to install and use according to electromagnetism compatibility information which is attached with it.
- Portable and mobile RF communication devices may influence S6600 performance, so S6600 should be kept away from them during using.
- Guidance and manufacturer's declaration stated in the appendix.

⚠Warning:

- S6600 Anesthesia System should not be used adjacent to or stacked with other equipment and that if adjacent or stacked use is necessary, S6600 should be observed to verify normal operation in the configuration in which it will be used.
- Class A equipment is intended for use in an industrial environment. S6600 may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

Table 1

Guidance and manufacturer's declaration –electromagnetic emissions		
The S6600 Anesthesia System is intended for use in the electromagnetic environment specified below. The customer or the user of the SECP-II should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The S6600 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The S6600 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Table 2

Guidance and manufacturer's declaration – electromagnetic immunity			
The S6600 Anesthesia System is intended for use in the electromagnetic environment specified below. The customer or the user of the S6600 should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment – guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30 %.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines	±2 kV for power supply lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % *U*T (>95 % dip in *U*T) for 0,5 cycle 40 % *U*T (60 % dip in *U*T) for 5 cycles 70 % *U*T (30 % dip in *U*T) for 25 cycles <5 % *U*T (>95 % dip in *U*T) for 5 s	<5 % *U*T (>95 % dip in *U*T) for 0,5 cycle 40 % *U*T (60 % dip in *U*T) for 5 cycles 70 % *U*T (30 % dip in *U*T) for 25 cycles <5 % *U*T (>95 % dip in *U*T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the S6600 requires continued operation during power mains interruptions, it is recommended that the S6600 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE *U*T is the a.c. mains voltage prior to application of the test level.			

Table 3

<table>
<tr><th colspan="4">Guidance and manufacture's declaration – electromagnetic immunity</th></tr>
<tr><td colspan="4">The S6600 Anesthesia System is intended for use in the electromagnetic environment specified below. The customer or the user of S6600 should assure that it is used in such an environment.</td></tr>
<tr><th>Immunity test</th><th>IEC 60601 test level</th><th>Compliance level</th><th>Electromagnetic environment - guidance</th></tr>
<tr><td>Conducted RF
IEC 61000-4-6</td><td>3 V_{rms}
150 kHz to 80 MHz outside ISM bands [a]
10 V_{rms}
150 kHz to 80MHz in ISM band [a]</td><td>3 V
3V</td><td>Portable and mobile RF communications equipment should be used no closer to any part of the S6600, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.
Recommended separation distance
$d = 1.2\sqrt{P}$
$d = 1.2\sqrt{P}$</td></tr>
<tr><td>Radiated RF
IEC 61000-4-3</td><td>10 V/m
80 MHz to 2.5 GHz</td><td>10 V/m</td><td>$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz
$d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz
Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). [b]
Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[c] should be less than the compliance level in each frequency range.[d]
Interference may occur in the vicinity of equipment marked with the following symbol:
  </td></tr>
<tr><td colspan="4">NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</td></tr>
<tr><td colspan="4">[a] The ISM (industrial, scientific and medical) bands between 150kHz and 80MHz are 6.765 MHz to 6.795 MHz; 13.553MHz to 13.567MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz.
[b] The compliance levels in the ISM frequency bands between 150 kHz and 80MHz and in the frequency range 80MHz to 2.5GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in these frequency ranges.
[c] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the S6600 is used exceeds the applicable RF compliance level above, the S6600 Anesthesia System should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the S6600
[d] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.</td></tr>
</table>

Table 4

Recommended separation distances between portable and mobile RF communications equipment and the S6600 Anesthesia System

The S6600 Anesthesia System is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the S6600 Anesthesia System can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the S6600 Anesthesia System as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter (m)**			
	150 kHz to 80 MHz outside ISM bands $d = 1.2\sqrt{P}$	**150 kHz to 80 MHz in ISM band** $d = 1.2\sqrt{P}$	**80 MHz to 800 MHz** $d = 1.2\sqrt{P}$	**800 MHz to 2 .5 GHz** $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.12	0.23
0.1	0.37	0.37	0.37	0.73
1	1.20	1.20	1.20	2.30
10	3.69	3.69	3.69	7.27
100	12.00	12.00	12.00	23.00

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 The ISM (industrial, scientific and medical) bands between 150 kHz and 80MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66MHz to 40.70MHz.

NOTE 3 An additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in the ISM frequency bands between 150kHz and 80MHz and in the frequency range 80MHz to 2.5GHz to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas.

NOTE 4 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Main structure, function and principle of system

System

Components included

- S6600 Anesthesia System includes the following monitoring devices, alarm devices and protection devices:

  ——monitoring for exhaling gas volume;

  ——monitoring for airway pressure;

  ——airway pressure limit;

  ——continuous pressure alarm for ventilation system;

  ——alarm for airway pressure high;

  ——alarm for MV high;

  ——apnea alarm;

  ——alarm for ventilation system integrity;

  ——oxygen fault alarm;

  ——oxygen fault protection;

  ——alarm for power supply fault;

  ——O2 monitor;

  —— anaesthetic ventilator;

  —— anaesthetic breathing system.

- The devices or components should all comply with the following relevant standards:

IEC 60601-1 Medical electrical equipment –Part 1: General requirements for basic safety and essential performance

IEC 60601-2-13 Medical electrical equipment—Part 2-13: Particular requirements for the safety and essential performance of anaesthetic systems

ISO 21647 Medical electrical equipment—Particular requirements for the basic safety and essential performance of respiratory gas monitors

ISO 8835-2 Inhalational Anesthesia Systems - Part 2: Anaesthetic breathing systems

ISO 8835-4 Inhalational Anesthesia Systems - Part 4: Anaesthetic vapour delivery devices

ISO 8835-5 Inhalational Anesthesia Systems - Part 5: Anaesthesia ventilators

IEC 60601-1-8 Medical electrical equipment - Part 1-8: General requirements for basic safety and essential performance- Collateral standard: General requirements, tests and guidance for alarm systems in medical electrical equipment and medical electrical systems

Components excluded

- The following components are not equipped on S6600 Anesthesia System, but they can be used with S6600.

  ——Ventilation gas monitor;

  ——Transfer and receiving systems of active anaesthetic gas scavenging systems.

- These components shall comply with the following international standards：

  ——ISO 21647 Medical electrical equipment—Particular requirements for the basic safety and essential performance of respiratory gas monitors

  ——ISO 8835-3 Inhalational Anesthesia Systems - Part 3: Transfer and receiving systems of active anaesthetic gas scavenging systems

- When connect these components, the following aspects shall be paid attention to：

  ——Ventilation gas monitor should be connected with the inhalation port of the breathing system. After assembling, leakage test shall be carried out.

  ——Transfer and receiving system of active anaesthetic gas scavenging system should be connected with exhaust port of the breathing system. After assembling, leakage test shall be carried out.

⚠ **Warning：**

According to requirements of standard IEC 60601-2-13,when using Anesthesia System：

- It shall be used with the following monitors：

  ——CO_2 monitor;

  ——O_2 monitor;

  —— exhalation gas volume monitor;

  —— anaesthetic gas monitor（when using vaporizer）.

- It shall also be used with transfer and receiving system of active anaesthetic gas scavenging system.

- Breathing circuit equipped with this system should comply with the ISO 5367 standard.

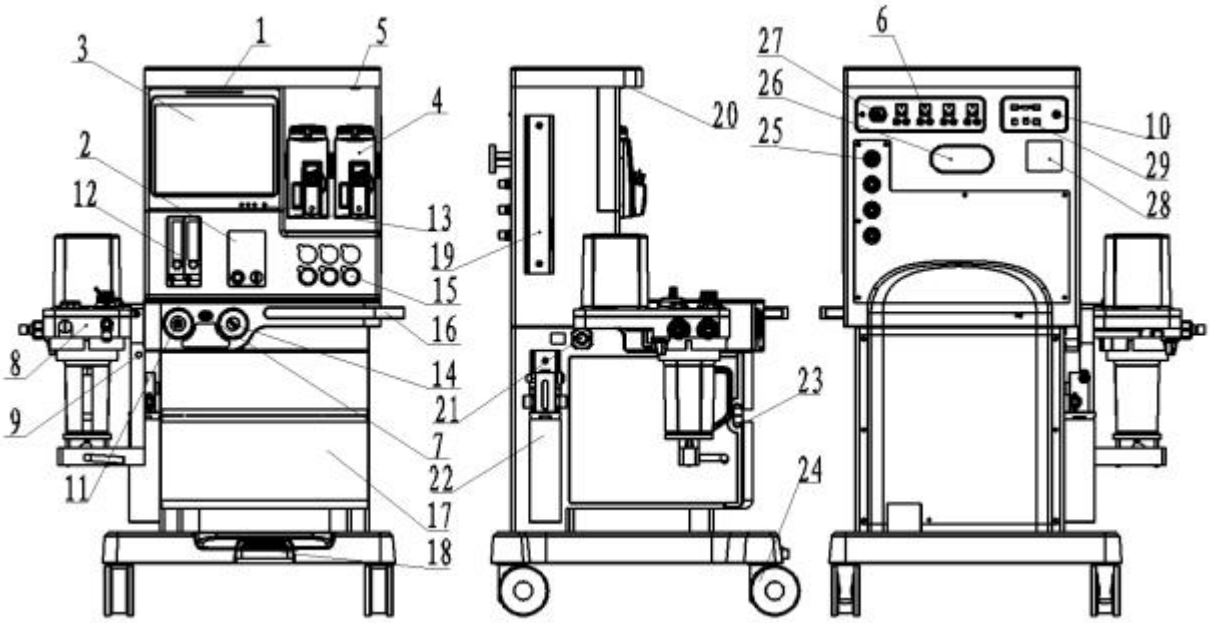
⚠ **caution：**

When users connect the above equipments to the Anesthesia System, the correspondent installation operation instructions provided by the equipment manufacture must be complied with. Whoever connect the single equipment to the Anesthesia System,the guidance or instructions for the normal operation of the separate equipment, which is requested by Anesthesia System and standard shall all be provided.

Structure of the whole machine

Anesthesia System comprises anaesthetic gas delivery system (include anaesthetic gas delivery piping, flowmeter, oxygen fault alarm and protective device), anaesthetic breathing system, anaesthetic gas scavenging system-transfer and receiving system(optional), anaesthetic vaporizer(with some functions of pressure compensation, temperature compensation and flow compensation, two models SE6A and SE6B, anaesthetic agents can be used have Enfluran, Halothane, Isoflurane, Sevoflurane) , anaesthetic ventilator, SJ-I respiratory gas monitor(optional) and main frame.

See figure 1 for the outline of whole machine.

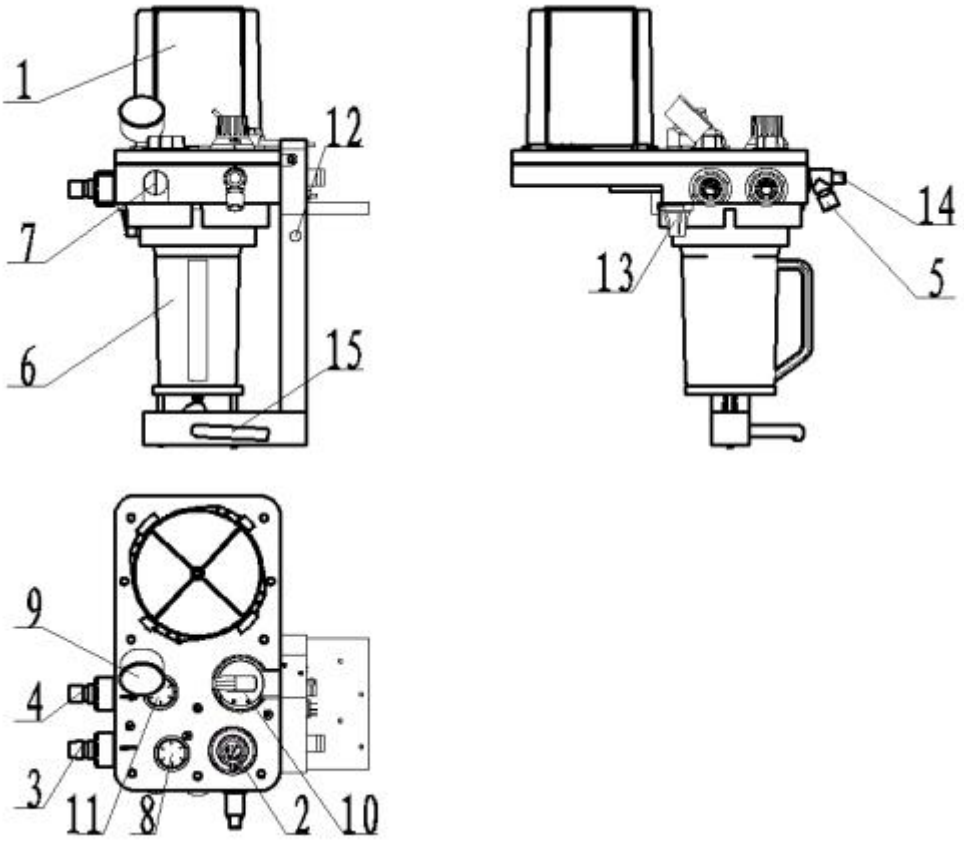


1 alarm indicator
2 reserve O_2 flowmeter
3 touch screen and display zone
4 anesthetic vaporizer
5 top lamp switch
6 auxiliary power supply socket
7 oxygen flush valve
8 anaesthetic breathing system
9 O_2 sensor cable connection port
10 AA/CO_2 sensor cable connection port
11 ACGO connection port
12 auxiliary flowmeter
13 mains switch
14 ACGO selector switch
15 pressure gauge of gas supply
16 handle used for move
17 drawer
18 brake control dual castors(optional)
19 Fixed groove
20 top lamp
21 exhaust port
22 anesthetic gas scavenging system-transfer and receiving system
23 drawer handle
24 castor
25 central gas supply connection port
26 hook
27 mains power input port
28 label
29 USB interface

Fig. 1 Outline of the whole machine

Anesthetic breathing system

Anaesthetic breathing system see fig.2.



1 breathing bellow

2 “APL” valve（adjustable pressure limit valve）

3 inhalation gas connector

4 exhalation gas connector

5 reservoir bag connection port

6 CO_2 absorber

7 oxygen sensor monitoring port

8 inhalation valve

9 airway pressure gauge

10“bag/vent” selection knob

11 exhalation valve

12 CO_2 cable connection port

13 water trap

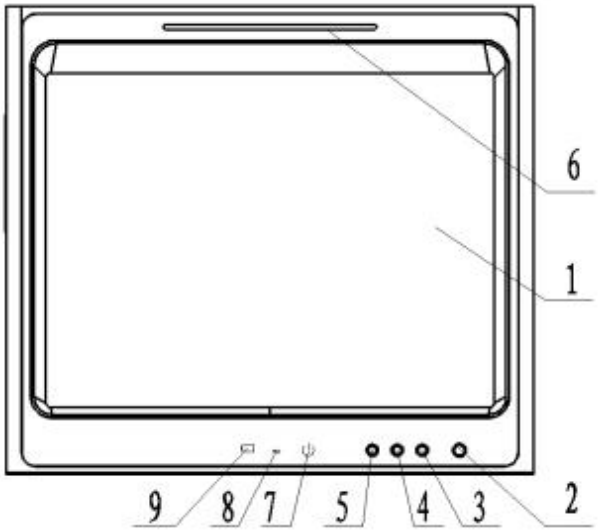
14 port blocked for leak test

15 handle for locking CO_2 absorber

Fig.2 Anesthetic breathing system

Anesthetic ventilator

The front panel of anesthetic ventilator see fig.3.



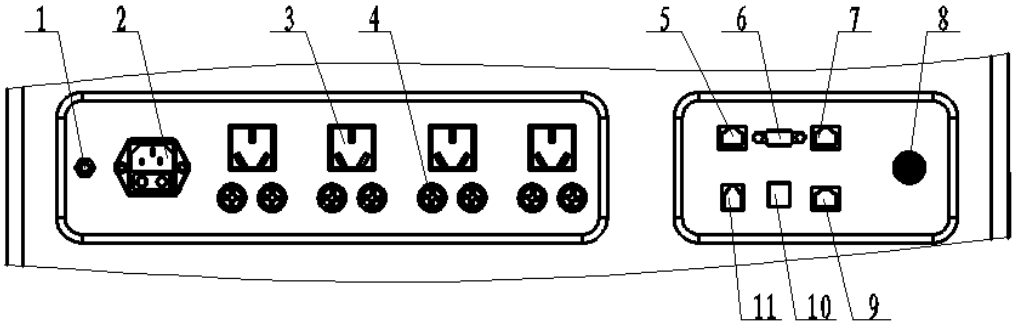
1 touch screen and display zone
2 power switch
3 right key
4 enter key
5 left key
6 alarm indicator
7 Running indicator
8 power supply state indicator
9 battery state indicator

Fig.3 Front panel of anesthetic ventilator

Connection port

Back panel of Ventilator

Back panel of Ventilator See fig.4.



1 equipotential terminal

2 power supply inlet socket with filter (include fuse)

3 auxiliary power supply socket

4 fuse holder(include fuse)

5 calibration interface(flow and pressure)

6 ISP interface(slave software update interface)

7 calibration interface(electronic flowmeter)

8 AG/CO_2 interface

9 network interface

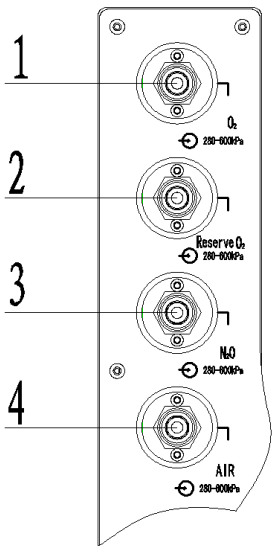
10 USB interface

11 RS232 (nurses call Interface)

Fig.4 Back panel of ventilator

Gas supply connector of the Anesthesia System

Gas supply connector of the Anesthesia System is at the back end of the equipment, see Fig. 8.



1 O_2 inlet

2 O_2 inlet (reserve)

3 N_2O inlet

4 AIR inlet

Fig.5 Gas supply connector of the Anesthesia System

stand-by power

- back-up battery：

  Model: LI23S020F

  Capacity: 4800 mAh

  Voltage: DC11.1V

  Quantity: 2PCS

- When the back-up battery is fully charged, the battery will supply power for the equipment about 2 hours.
- If the machine is powered by battery, the power state indication place will display the signal of “ ”.
- When the power is changed from AC to back-up battery, the equipment will keep same functions as working under AC.

Main power supply -----Back-up battery transition

- It will switch over to back-up battery automatically when the main power supply fails during operation
- When the back-up battery power the ventilator, there is sound indication from the machine, and the power state indication place will display the signal of “ ”.

Low voltage of back-up battery

- Battery power can only be maintained for a period of time. When the voltage of back-up battery is low, the power state indication place will display the signal of “ ”,and there will be a sound alarm. At this time, power supply should transit to AC or switch off the power of ventilator, and charge the battery.
- Otherwise, system will trigger 【!!!The system will shut down】 high priority alarm, power supply about 4 minutes, the system automatically power off.

Warning：

Power supply should transit to AC when the battery is low voltage.

Charge of back-up battery

- When the equipment is supplied by AC power, the battery will be charged automatically,the power state indication place will display the signal of " ▮■ ". And the power state indication place will display the signal of "⊣●⊢"after charging fully.
- When the equipment is supplied by AC power, power supply state indicator (item 8 of fig.3)lights (green for a long time), if battery is charging, battery state indicator (item 9 of fig.3)lights (green), if battery is fully charged, battery state indicator (item 9 of fig.3) is off.
- Charge can be carried out continually, or intermittently.
- The back-up battery should be charged in time after using, generally it should be charged for less than 8 hours under the state of operation or standby.

Discharge of back-up battery

- It should be discharged in regular time when no using for a long time.
- Discharge method: Do not connect the AC power, and supply the ventilator by back-up battery till the power state indication place display the signal of " ▮□ ".
- It should be charged in time after discharging.
- Intervals of discharge do not beyond 1 month.

Replacing of the back-up battery

- Usually, the battery can be used for 3 years, if it is often used in over voltage state, or often power cut or the environment temperature is excessive high, efficiency will become lower the and life will be shorten.
- The battery should be replaced when the efficiency receded or shattered. Battery replacing should be managed by special technical personal. When in replacing the battery, firstly switch off the AC, and then open the cover to get the battery out. Pay attention to the specification of the battery and do not overturn the polarity.

⚠ **Warning：**

Do not throw the battery into the fire in case of explosive; Do not open or destroy the battery, because it contains injurant which may injure skin and eyes. Please dispose the battery under (by) the local environment law.

Installation or replace fuse

- Replacement of AC power supply fuse:

  When AC input power supply is normal, power supply state indicator (item 8 of fig. 6) is not on. After opening mains switch（item 13 of fig.1）, the backup battery works, at this time the fuse of power supply inlet socket with filter（item 1 of fig.7）shall be checked. Pull out the plug of power cord and poking fuse socket with screw driver, take out fuse to check. If it has been damaged, the fuse with the same size and model shall be replaced.

- Replacement of auxiliary power supply fuse:

  When AC input power supply is normal, auxiliary power supply does not work, but others are normal, at this time the fuse of its fuse holder（item 4 of fig.4）shall be checked. Screw off the cover of fuse box with screw driver, take out fuse to check. If it has been damaged, the fuse with the same size and model shall be replaced.

- Size and model of fuse

  —— AC power supply T10AH 250V

  ——auxiliary power supply T2AH 250V

⚠ **Warning：**

1) Before installing or replacing fuse, you must pull out the mains plug of power supply cord from the mains-outlet.

2) When replacing fuse, it shall be noticed that the size and model is the same with the original one.

Preparation

Gas supply connection

- The anesthesia system provides pipeline gas supply (O_2, N_2O and Air) ports, and three kinds of configuration:

  ——Oxygen (O_2) and nitrous oxide (N_2O)

  ——Oxygen (O_2) and air (AIR)

  ——Oxygen (O_2)

⚠ **Warning：**

1) To ensure gas supply cleaning can be used, please be sure to use medical gas supply.
2) When anesthesia system stopping the gas, medical gas pipeline still has certain pressure, before the pull off gas hose, please release the pressure inside the pipeline.
3) Fault pipeline gas supply system may lead to anesthesia respirator, anesthesia gas delivery system, anesthesia and ventilation system stop working, so should at least have a full bottle of oxygen, and pre-installed to the anesthesia system, so that the cylinder gas in fault can use gas supply pipeline system, maintenance of anesthesia system work normal.
4) Pipeline gas supply runs out, switched to independent simple breathing patterns, for ventilation of patients.
5) When gas supply pressure of medical gas pipeline is more than 200kPa, there will be a technical alarm 【!!!Low Driven Gas Press】, please contact professional servicer or our company in time.

Gas supply connection

- Pipeline gas supply connection please according to the following steps:

  ——Connect one end of the high O_2 hose to the oxygen central gas supply port, Connect the other end to O_2 inlet port of the anesthesia system , and tighten union nuts;

  ——Refer to the above step, connect the high N_2O hose;

  ——Refer to the above step, connect the high Air hose;

  —— Collated all gas hoses, prevent stumble.

Power supply connection

- The way of Power supply connection see the sub-clause “power failure test ”.

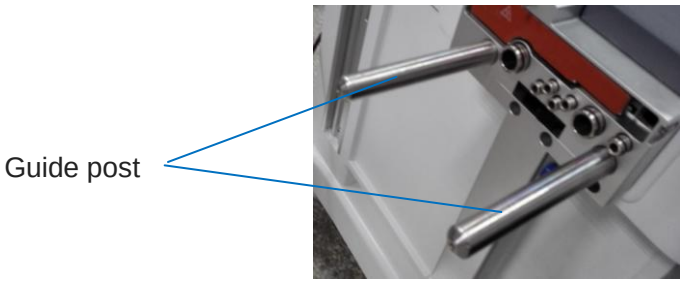
Installation of anesthetic breathing system

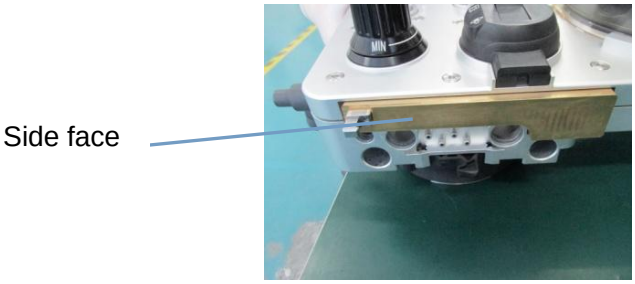
Note：

The anesthetic breathing system used with anesthesia system shall comply with the requirement of ISO 8835-2.

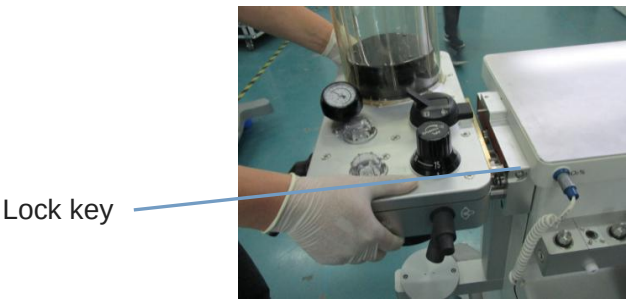
Installation of the breathing circuit

- At first circuit block adapter guide posts clean, guide post holes and then loop the loop body side alignment guide pin adapter block.





- Push the loop push the loop adapter block, so the loop is connected to the adapter blocks without gaps. Meanwhile circuit lock key is automatically ejected.



Installation of the bellow

> ⚠ **Warning：**
>
> Before installing the bellows cover check whether the seal of bellows seat is normal, if prolapse or tilted, please ring up and then install the bellows cover.

- Ensure that the circuit integral blocks have been fixed, installed bellows holder, align with the corresponding hole touse a slightly downward pressure, and tight the 4 nuts.

- Put the folding pocket bottom last lap in the loop bellows holder, ensure the folding bag and bellows seat is connected closely.

- Put the bellows cover card edge alignment card slot of loop, cover the bellows , to ensure that the bellows cover uniform pressure on the seal.

- Both hands gripping the external side of the cover, along the clockwise, make sure that the side with scale marks towards the operator.

Installation of the flow sensor

- The arrow direction of flow sensor is consistent with the arrow direction on the breathing circuit, and the silk-screen side towards upside;

- Flow sensor needs to be will be horizontal inserted in;

- Put the respiratory connector and its locking nut together towards the inspiration flow sensor connector;

- Clockwise turn the respiratory locking nut tightly.

Warning：

1) Please be careful, when moving the equipment, to avoid striking the inhalation gas connector and damaging the flow sensor.
2) Install flow sensor in place and screw locknut tightly, otherwise the flow monitoring value is incorrect because of gas leakage.
3) Y connector at patient connection port should face downwards, prevent the condensation of water vapor from inflowing into the anesthetic breathing system, because water vapor will affect the flow sensor to measure the tidal volume, lead to inaccurate.

Notice：

Before installing the flow sensor, make sure that the sealing ring is intact, and inspection sampling joint non clogging.

Installation of breathing tube and Y connector

Notice:

1) When installing a breathing tube, please hold the end of the tube joint, in order to prevent damage to the tube.

2) Before installing breathing tube, follow the steps as shown in the packing instruction.

- Connect two end of the breathing tube separately to the inhalation gas connector and the exhalation gas connector in place.

Installation of O_2 sensor

Warning：

1) Before installing O_2 sensor, make sure that O_2 sensor seal is well, otherwise it will cause anesthetic breathing system leakage.

2) Waste disposal for O_2 sensor should be according to the regulations of the local medical waste disposal.

3) O_2 sensor must be installed in place, otherwise it will cause anesthetic breathing system leakage.

- Put the thread of O_2 sensor towards O_2% position of anesthetic breathing system, screw O_2 sensor clockwise and tightly;

- Insert one end of O_2 sensor cable into O_2 sensor hole.

Installation of Soda lime tank

Warning：

1) The CO_2 absorber only use for air, oxygen, nitrous oxide, enflurane, isoflurane, sevoflurane, desflurane and sevoflurane, cannot be used in chloroform or trichloroethylene environment.

2) The CO_2 absorber is only filled by Soda Lime.

3) In accordance with the description of the color change of Soda lime on Soda Lime package, check the Soda Lime color in the process of using anesthesia system and after use, to take corresponding measures to deal with.

4) Switch off all gas timely after using the anesthesia system, prevent Soda Lime dry, after Soda Lime dry completely, if contact anesthesia gas, reacts and the release of carbon monoxide, endanger patient safety, then replace the Soda Lime timely.

5) Do not let any part of the body directly contact the absorption tank material, such as the bottom water absorbent, filter, if contact with eyes or skin, immediately rinse with water on affected area, and medical treatment.

6) Install the absorption tank, shall ensure that the, the absorption tank bottom sealing ring and a support member without adhesion Soda Lime particles etc. foreign body, if yes, clear after the installation, otherwise it may cause circuit leakage.

7) If the anesthesia system is not configured BYPASS function, do not change the absorption tank during ventilation.

8) Ensure the regular replacement of absorbent, often clean the absorption tank, in order to maintain anesthesia and ventilation system cleaning environment.

- Installing Absorption Tank

Notice：

1) Before installation, check the water cup joint is in the open state, if not, will be converted to open.

2) Catch water cup joint push upwards and counterclockwise rotation, joint is in a closed state; a clockwise rotation, the joint is open.

——Grab handle canisters, and the canister on the two guide grooves.

——Slightly with the point force in place to promote the absorption canister, grab the canister handle, and the other hand grasping the handle lock branch soda lime to absorb tank counterclockwise operation.

Notice：

Reinstall the Soda Lime tank, do loop leak test, please see chapter “test before operation”.

- Replace Soda Lime

Notice：

1) Absorption Soda Lime tank in the absorption of carbon dioxide, the color will change, to decide whether to replace theSoda Lime.
2) Soda lime color for reference only, please use carbon dioxide to monitor data as the basis, to decide whether to replace the Soda Lime.
3) Absorbent color change, if place a few hours, it reverts to the original color, may be misleading and was againmisuse. Should be in accordance with the provisions of the local medical wastes treatment timely disposal.
4) Please use the company recommended that you use MedisorbTM Soda Lime.
5) Before using the product, the complete specification can watch it again.

——Please see subclause “removing Soda Lime tank”.

——A new sponge filter placed in the bottom of the absorption tank, pour the Soda Lime into absorption tank, put a new sponge filter in Soda Lime. Wipe the absorber dust.

——Align cover slot with the lock protruding tongue of absorption tank , press the cover, turn its locking ring clockwise and make sure cover is sealed tightly to prevent leakage and overflow. The positioning arrows indicate how to assemble correctly.

Warning：

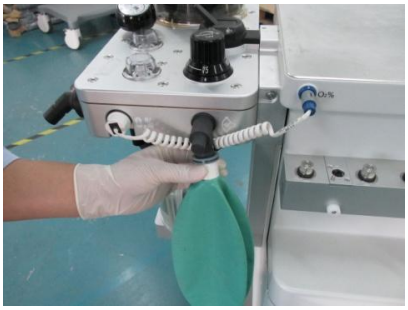
After Soda Lime loaded, before installation, clean Soda Lime tank inlet and outlet, to prevent dust and particles into the breathing circuit.

Notice：

1) Install bottom of sodium lime tank, please check the seal is intact.
2) Soda Lime tank sponge can not be reused, must replacing the sponge filter while replacing Soda Lime each time.
3) Soda Lime cannot pour over Soda Lime tank on the MAX logo.

Installation of reservoir bag

- Ensure reservoir bag appearance is without damage, its wrinkles is without adhesion;
- The reservoir bag port shall be aligned with the reservoir bag connection port, connect them by appropriate force.



⚠ **Notice：**
For easy operation, we recommend that the reservoir bag should be used with silica gel breathing tubes.

Installation of vaporizer

⚠**Warning：**

1) The anesthetic vapour delivery device used with anesthesia system shall comply with ISO 8835-4;
2) When using anesthetic vaporizer, the equipment shall be used with the anesthetic gas monitoring device comply with requirements of ISO 21647.

⚠**Notice：**

1) The installation and use of vaporizer see its user's manual for the detailed instructions.
2) Check the O ring of vaporizer base, if it is out of shape and aged, the installation is not in place, so replace it to avoid leakage or un-normal work.

- Verify that each manifold port valve O-ring is intact. If necessary, remove the existing O-rings and fit one new O-ring to each port valve, as described in the relevant anesthesia system User manual. Replacement O-rings are supplied with each vaporizer.
- After confirmation, Hold the main body of the vaporizer in an upright position with both hands. Lower the vaporizer onto the manifold, ensuring that the vaporizer interlock ports engage correctly with the manifold port valves.
- Turn the interlocking lever clockwise to lock the vaporizer onto the manifold.
- The equipment may select enflurane or isoflurane or sevoflurane or halothane or desflurane vaporizer with temperature and flow rate compensation function;and can be equipped with one or two Anaesthetic vaporizers. The vaporizer mating with the Anesthesia System nominated by our company shall be used. Otherwise, the performance of them will be decreased.

- There is the self-lock device on this vaporizer.
- Turn the concentration-regulating-knob to adjust the required concentrations of anaesthetics.
- See the manual for the detailed vaporizer instructions.

Installation of module

> ⚠ **Notice：**
>
> In order to ensure patient safety, in the use of the anesthesia system needs matching proper gas monitor module. If the use of the anesthesia system is not configured gas monitor module, please meet with ISO80601-2-55 standard gas monitoring device in the use of the anesthesia system.

Installation of AG module

- The mainstream type of anesthetic gas monitor installation, in accordance with the chapter " Gas monitoring module" instructions.
- The sidestream type of anesthetic gas monitor installation, in accordance with the chapter " Gas monitoring module" instructions.

Installation of CO_2 Module

- The mainstream type CO_2 monitor installation, in accordance with the chapter " Gas monitoring module" instructions.
- The sidestream type CO_2 monitor installation, in accordance with the chapter " Gas monitoring module" instructions.

Exhaust gas discharge port

- The anesthesia system exhaust port is located in the back of the anesthesia system, anesthesia system produced exhaust gas, including anesthesia ventilator exhaust gas side stream gas monitor output gas and respiratory output gas, were expelled by the exhaust interface.
- AGSS joint diameter is 30mm, its special joint is taper 1:20, conforming to ISO 5356-1 2004 regulations. Through this connector to connect anesthetic gas purification device and exhaust gas treatment system.
- The interface position, please see item 21 in fig.1.

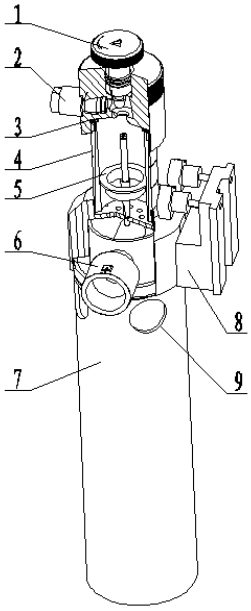
> ⚠ **Warning：**
>
> 1) Please do not jam AGSS emissions interface, otherwise anesthesia respirator will not work.
>
> **2)** Before working, the equipment shall be equipped with ISO 8835-3 anesthetic gas sgavenging system transfer and receiving system, in order to purify the operation room.

AGSS transmission and collection system

Notice：

The transfer and receiving system of active anesthetic gas scavenging system used with the anesthesia system shall comply with the requirements of ISO 8835-3.

AGSS constructions



1 flow limiting valve

2 AGSS outlet (connect to hospital sewage pipe)

3 the filter

4 observation window

5 float

6 AGSS intake port (30mm endocone connector)

7 gas volume

8 the fixed plate

9 pressure compensating port

Installation of AGSS

- The AGSS system is fixed on the equipment left by nut, see fig.1.
- Transmission system hose 30mm endocone connect to equipment AGSS emissions interface.
- Transmission system hose 30mm external cone connect to AGSS collection interface .
- AGSS collection system endocone connect to the hospital exhaust gas treatment system.

Exhaust dealing system test

- AGSS transmission and collection system is processing system for low flow type, suitable for pumping speed range is 25 ~ 50L/min.
- After AGSS system has been connected, confirm the match of pumping velocity and AGSS system, doing the actual pumping test.

Notice：

Do not block pressure compensation port in the AGSS collection system when testing.

Warning：

The AGSS transmission and collection system is not suitable for combustible anesthesia gas.

Test before operation

⚠ **Notice：**

1) Before operating the anesthesia system, must carefully read each component description;
2) Make sure you understand all the "dangerous", "warning" and "attention" and other information;
3) Use disinfection components;
4) Connection, using and testing method of each system component must to be understood.
5) Before operating the anesthesia system, must accomplish this chapter all testing and inspection, and testing of other system components.
6) If the test fails, do not use the equipment, and contact the customer service and maintainer to repair this equipment.

Test interval

- Before the use of anesthesia system for each patient, the anesthesia system needs to do basic operation test or maintenance to ensure equipment safety and effective.

Test item	Testing time
Check system	◎
Pipe gas supply test	○
Spare gas cylinder test	○
AGSS system test	◎
Anesthesia and ventilation system test	◎
Power failure test	◎
Fast O2 test,include electronic and push button	◎
Evaporator pressure test	○
Flow control device test,include electronic and mechanical	○
Alarm test	◎
○ ： before first patient use in the first day ◎ ： before each patient use	

Check system

The initial examination of the anesthesia system, ensure that comply with the following requirements before use :

- Equipment in good condition;
- Casters has been locked, and no loosening, can prevent the anesthesia system movement;
- System components is connected properly;
- Supply system is connected properly, the screen showed a normal pressure monitoring;
- Cylinders gas supply, gas is enough, to ensure that cylinder valve is closed;
- Safety oxygen control switch is intact and function of flowmeter is normal;
- The function of electronic flowmeter is normal;
- ACGO switch is intact;
- Breathing circuit is connected properly, respiratory tube is intact, Soda Lime enough;
- Anesthesia ventilation system has been fixed on the seat, and the nut is screwed up;
- Adjustable pressure limiting valve, its calibration points to the minimum (MIN);
- The evaporator is installed and have adequate locking, anesthetics is enough, evaporator have been closed;
- For airway maintenance and equipment for tracheal incubation was ready, in good condition;
- Required emergency equipment and medicines have been ready, in good condition;
- Power line is connected to the AC power supply, AC power indicator light;
- Spare battery installed nondestructive;
- To ensure that all switch of anesthesia system work normally;
- To ensure that the anesthesia ventilator associated parameter and alarm limit set for the clinical level;
- To ensure that the system is in standby state.

Pipe gas supply test

- The center gas source pressure hose of O_2 is screwed to oxygen port on the back of the machine;
- The other end of pipeline connected to the wall type air connection;
- To ensure that the central gas supply pressure in the range of 0.28 ~ 0.6kPa;
- Press system switch key, start the system, the main interface displayed normal O_2 pipeline pressure;
- Disconnect oxygen pipeline gas source;
- Should be observed in the main interface of monitoring O_2 pipeline pressure 0.0MPa, system send out 【!! No O_2 Pressure】 alarm prompt;
- If the current O2 is selected as the system drive gas, O_2 gas pressure is lower than 0.2MPa, 【Low Driven Gas Press】 trigger alarm;
- To access the N_2O pipeline gas source, and refer to step1) - step 7), test N_2O gas pressure gauge display and pressure gauge zero function;

Notice：

1) Must access the oxygen first, then access nitrous oxide, can be set to nitrous oxide as cut gas.
2) Different with O2 pipeline, cut off the gas pipeline gas source, the pressure reducing process, system does not emitits pressure alarm correlation.
3) Not connected to the O2 source, interface 【O2】 softkey to gray is not operable.
4) Pressure monitoring is not accurate, please contact factory to be modified.

- Access the Air pipeline gas source, and refer to step1) - step 7), test Air gas pressure gauge and pressure gauge zero function;
- If the current machine driven gas Air is selected as the driving gas, disconnect the Air pipeline gas is lower than 0.2MPa, 【!!!Low Driven Gas Press】 trigger alarm.

Power failure test

Notice：

1) Voltage must be consistent with the calibration of machine backside plate specifications, voltage range: 100V-240V ~ (single).
2) Check whether installation of fuse and ground connection is good.
3) Power failure, please switch to the safety of oxygen flowmeter, manual ventilation.
4) When resumed from over 30s of an interruption of AC power supply, the ventilation devices, alarms and gas monitoring devices of the anesthesia system still work normally.

Insert the plug into the socket on the wall;

- Press the system on / off key, starting system, unplug the power line;
- Should be observed in AC indicator lights off of AC power, battery powered lights flashing, alarm information display area prompt 【!AC Disconnect】 alarm;
- Put the power line connect to the AC power supply socket;
- Should be observed in AC indicator lights on of AC power, the battery power indicator light, from the original 【!AC Disconnect】 prompt alarm automatically canceled;
- Long press again system On / off key, pop-up box to select 【OK】 button, enter the 5S countdown, after count down shut down system automatically; if you choose " ☒ " button, quit interface, return to the current state, the shut down cancel.

Flow control device test

Waring：

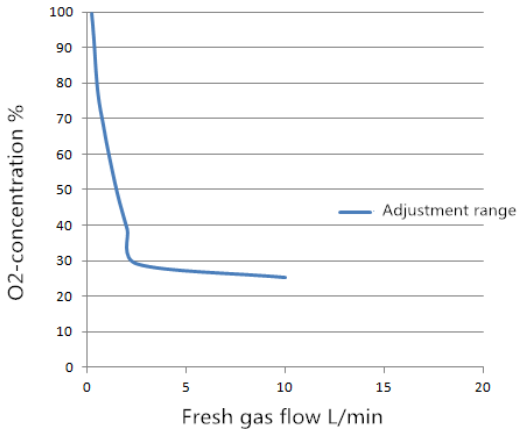
1) To avoid harm to the patients, if oxygen and N_2O electronic sensing device can not provide the correct ratio of oxygen and nitrous oxide, please switch to the safety of oxygen flowmeter, which provide fresh air ventilation.

2) If no oxygen, if there is N_2O gas flow through the system, must use method which has been confirmed and secured toe mission and collection.

Equipped with a electron lowest oxygen transport system to avoid hypoxia mixed gas, can be detected according to the following function:

- When nitrous oxide as the carrier gas, the lowest oxygen transfer capacity for the 200mL/min. Fresh gas flow rate is greater than 0.8 L/min, the lowest oxygen concentration limit was 25%. Fresh gas flow settings below 0.8 L/min, the oxygen concentration automatically elevated to oxygen flow is equivalent value to 200 mL/min.

- When choosing the air as carrier gas, do not start SORC function, and range of 100% air can be detected in the entire flow regulation.



Evaporator pressure test

Warning：

1) In order to avoid damage the evaporator, before use, should set the fresh gas flow to the 100mL/min;
2) Evaporator can only use method of Selectac series, when test needs to ensure that before the test has the evaporator is locked;
3) In the testing process, anesthetic by fresh gas exports (suction port) output, connections and emissions of these anesthetics must use method has been confirmed and secured.

The following test of anesthesia system evaporator, to ensure its normal function:

- To ensure that the evaporator has been in accordance with the fourth chapter "installation of vaporizer " installed;
- Press the system on / off key, starting system;
- Access pipeline gas supply or cylinders gas supply;
- Set the oxygen concentration is 100%, set the fresh gas flow rate of 6L/min, and keep the stability of flow;
- Conditioning evaporator concentration from 0 ~ 1%;
- Should be observed, in the whole process flow of oxygen reduction shall not exceed 1L/min;
- If the observed flow decreased more than 1L/min should be replaced with an evaporator, and then refer to the step 1) to step 5), re-testing, if the flow reduction is still more than 1L/min, it means the system failure, do not use the anesthesia system.

Notice：

The evaporator in the "OFF" ("off") and higher than the very low output volume between the first scale range of "0",not in this range test.

Flush oxygen test

- Connect to O_2 pipeline gas resource or gas cylinder;
- In the standby state or condition, press the flush oxygen button O_2+ or long press the 【 O_2+】 soft key , will show 【rapid oxygenation 】 at the system prompt information area; keep pressing time exceeds 15 s, trigger alarm 【rapid oxygenation failure】;
- During rapid oxygenation, release flush oxygen button O_2+ or loosen【O_2+】soft key, prompting information and alarm information will disappear.

Respiratory circuit test

Warning：

1) Check whether there is any stuff in the breathing circuit, if yes please clean, otherwise it will block the gas flowing to the patient, which may cause casualty accident. Please ensure that no stuff.

2) Ensure that the breathing circuit is properly connected and undamaged.

Ensure that the single direction valve on breathing circuit work on normal:

- When Inspiration, inspiration direction valve open, the expiration direction valve closed instantly, indicates that the inspiration direction valve work on normal.
- When expiration, expiration direction valve open, the inspiration direction valve closed instantly, indicates that the expiration direction valve work on normal.

Bellows test

- Press system on / off key, boot device, and keep the device is in the standby state.
- Manual / machine control switch is arranged in the machine control position.
- Set the fresh gas flow to a minimum.
- Blocked the patient end export, closed respiratory loop.
- Press the fast O_2+ button, fill in bellows, make the bellows folding bag rises to the top.
- Ensure that the pressure of airway pressure table can not rise to more than 15 cmH_2O.
- The bellows folding bag shall not fall, if falling means the bellows leak. Please re-install the bellows.

Mechanical ventilation respiratory loop leakage test

Notice：

1) Before breathing circuit leakage detection needs to ensure circuit is connected properly, and pipeline is intact.

2) Before breathing circuit leakage detection needs to ensure the system is on standby state.

According to the follow method to do the leak test:

- Make sure that the supply gas pressure is normal;
- Set the bag/vent switch to vent position;
- Plug the Y piece into the leak test plug to close the breathing system;
- Turn off fresh gas inputs;
- Push the O_2 flush button to fill the bellows, folding bag rising to the top;
- Press【Standby】->【Menu】->【Leak Test】->【Auto Ventilation check】;

- Press【Start】,System starts respiring system leak detection, meanwhile display fill loading. If the check passed, will display information【Check Passed】. Otherwise display information【Check Failure】,at this time need to check whether the respire loop connection is right, pipe whether the pipe is intact,ensure if there are no problem, re-check the leak.

⚠ **Notice:**

1) In the leak testing process, select【Cancel】,will stop the testing process, This check is fail.
2) Select【skip】,jump the testing.
3) If the leak test failure, display【Check Failure】,please check each possible leak source: bellows, breathing loop pipeline, Soda Lime tank and its connectors, make sure it is intact or connection is right. In the examination of Soda Lime tank, please note that check the Soda Lime tank seal is pasted with Soda Lime particles, if any, please clear.
4) Leak detection, airway pressure and PEEP pressure will compare monitoring board and protection board measurements, such as two boards to monitor airway pressure difference is greater than 2cmH2O,or to monitor PEEP pressure difference is greater than 2cmH2O,the self-test fails, please user to manual ventilation.
5) If the breathing circuit leakage, do not use the equipment, please contact maintain officer or the customer service department.

Manual ventilation respiratory circuit leakage test

According to the follow method to do the leak test:

- Make sure that the supply gas pressure is normal.
- Set the bag/vent switch to bag.
- Plug the Y piece into the leak test plug to close the breathing system.
- Connect the manual bag to the manual bag port.
- Set the APL valve 75cmH2O.
- Turn off all fresh gas inputs.
- Push the O_2 flush button to let the pressure increase to approximately 30 cmH_2O on the airway pressure gauge.
- Press【Standby】->【Menu】->【Leak Test】->【Manual Ventilation check】;
- Press【Start】,System starts respiring system leak detection, meanwhile display fill loading. If the check passed, will display information【Check Passed】. Otherwise display information【Check Failure】,at this time need to check whether the respire loop connection is right, pipe whether the pipe is intact,ensure if there are no problem, re-check the leak.

APL Valve Test

- Manual / machine control switch to manual position;
- Ensure system on STANDBY mode, if not, press【Standby】button,select 【ok】 to enter STANDBY mode;
- Connect the manual breathing bladder to the manual gas-save bag connector of breathing circuit;
- Put “Y” shape of bellows into leakage test plug of circuit to block the gas outlet of “Y“ shape.
- Adjust the APL valve, keep the valve in the fully closed （75 cmH2O position;
- Set oxygen concentration as 100%,set fresh gas flow as 3 L/min;
- Press quick O2+or press【O2+】on the screen,keep the manual ventilation bagfull
- Ensure the APL gauge no more than 85 cmH2O. Pressure fluctuation is permitted;
- Adjust APL Valve control the rotation,make APL valve pressure to 30 cmH2O;
- Ensure the APL gauge as 30 cmH2O;
- Adjust APL Valve control the rotation,make APL valve pressure to minimum（MIN position）;
- Ensure the AP gauge less than 5 cmH2O;
- set fresh gas flow as MIN;
- Press quick O2+or press【O2+】on the screen,Ensure the AP gauge as 0 and no less than 0cmH2O,APL Valve Exhaust no abnormal.

Anesthesia ventilator test

According to the following steps and methods to do the anesthesia system and ventilator test:

- Press the start button, start the system;
- Put manual / machine control switch to control position;
- Put the test lung connected to the Y tube connector;
- Set fresh gas flow as 100mL/min, ensure the minimum flow or close;
- Set the system to the standby mode;
- Through the operation interface, in accordance with the following parameters set options:

  ——Mechanical ventilation mode: select 【V-CMV】 - > 【Set mode】

  ——Tidal volume TVe: 500mL

  ——Respiratory frequency Rate: 12bpm

  ——Breath Ratio I:E:1:2

  ——Pressure limit level Plimit: 30cmH2O

  —— Positive end expiratory pressure PEEP: OFF
- Oxygen meter on the screen, touch control in 0.5 ~ 1L/min;
- Press the rapid oxygenation button, the bellows folding bag completely supports;
- Click on the【Start Ventilation】 screen hotkey, into the ventilation condition;
- Observably, has launched the mechanical ventilation, bellows folding bag regular rising and the basic function of anesthesia ventilator after test, according to the following steps and methods of anesthesia respirator leakage test:
- The system is set to the standby mode;
- Set the fresh gas flow about 0.3L/min
- The bellows on the Y shape is inserted into the test plug leakage circuit, blocking the outlet Y shape;
- Press the rapid oxygenation button, the bellows folding was propped up, loosen the rapid oxygen filling button;
- Should be observed, folding bag doesn't fall down, otherwise the system has a leak, should investigate the cause and find solution then test again according to the above method.

⚠ **Notice：**

When anesthesia ventilation system leakage, remove as much as possible leakage, such as folding, box cover, box of Y tube is installed in place, the hose with such phenomena.

Check AGSS transmission and collection system

- Invent the AGSS, check float can freely move up and down. If the float motion any blocking adhesion phenomenon or appears damaged, it must be reset or replace the float before use.

> ⚠**Notice：**
>
> Do not Block the pressure compensation entrance of AGSS when checking.

If the float does not float, there may be several reasons:

- Float adhesion. Please check the free movement of the float on the above way.
- Float slowly rising. The filter may be blocked, please press removing filter in the manner described check if the filter in the upper cap is blocked.
- Exhaust gas treatment system does not work or pumping gas flow rate is lower than the normal work of AGSS flow 50L/min. Please check the waste gas treatment system test are described by way of waste gas treatment system.

Preparation before system operation

- Ensure that relevant parameters of ventilator and alarm limits set for clinical application, the specific settings can refer to the relevant sections of the eighth chapter of operation and parameter setting.
- To ensure that the system is in standby state.
- Requires the following equipment: airway maintenance, manual ventilation and tracheal incubation device, and the application of anesthesia and emergency medicine.
- Manual / machine control switch is set to manual position.
- Manual breathing bag port connects to manual breathing bag.
- Close all evaporator.
- Regulating the rotation control APL valve, the valve in the fully open state of APL (MIN).
- Fresh gas flow is set to minimum.
- To ensure that the breathing circuit is properly connected and undamaged.

Alarm Test

Anesthesia system automatically performs self-checking once it is turned on. The alarm lamp blinks once as per yellow -red sequence, and a beep is given out. Boot-strap menu is displayed in the screen. When" Selftest results"、 Automatic circuit leak test/compliance test" and "Manual circuit leak test" is finished, the equipment accesses its standby interface directly. This indicates that the audible and visual alarm indicator works normally.

⚠**Notice:**

1) During alarm testing, operator shall stay in a position where the alarm lamps and alarm suggestive prompts may be observed and the alarm tone may be heard.
2) The device is powered on, monitoring board or protection panel will automatically buzzer sends two consecutive "beep", but it is not the sound of the alarm horn.
3) Before operation of every patient, alarm test shall be carried out.

Setting before alarm test

- Setting before alarm test please refer to chapter" Anesthesia ventilator test" steps.

O2 Concentration Monitoring and alarm test

The test is for the anesthesia system with O2 sensor on the configuration only, if no does not need the test.

- Manual / machine control switch is arranged on the manual position.
- Remove oxygen sensor from the circuit, place it in atmosphere 2 ~ 3 minutes, screen 【FiO2】 parameter monitoring value around 21%.
- Click on the 【Menu】- > 【Alarm Setup】 into alarm setup interface, select 【Alarm Limit】 options, select 【FiO2 Low Limit】set to 50%.
- Observe the screen physiological alarm, alarm trigger 【FiO2 Too Low】.
- 【FiO2】 inside 【FiO2 Low Limit】 is set lower than the current value of the 【FiO2】 monitoring , the screen prompt 【FiO2 Too Low】 alarm disappeared.
- The oxygen sensor re-installed back into loop, please see installation oxygen sensor.
- Click on the 【Alarm】 - > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【FiO2 Hig h Limit】: set to 50%.
- The manual breathing bladder connected to manual breath air interface of breathing circuit, press the flush oxygen filling button, filling in manual ventilation bag, 2 ~ 3 minutes later, the screen 【FiO2】 parameter monitoring value is about 100%.
- Observe the screen physiological alarm, alarm trigger 【FiO2 Too High】.

- 【FiO2】 inside the 【FiO2 High Limit】 is set to 100%, the screen physiological alarm prompt 【FiO2 Too High】 alarm disappeared.

MV low alarm test

- Click on the 【Alarm】 -> 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【MV Low Limit】: set to 8.0L/min.
- Observe the screen physiological alarm, alarm trigger 【MV Too Low】.
- Click on the 【Alarm】 - > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【MV Low Limit】: set to the default value. Tips 【MV Low Limit】 alarm disappeared.

Continuous positive airway pressure high alarm test

- Manual / machine control switch is arranged on the manual position, the manual breathing bladder connected to manual breath air interface of breathing circuit.
- Adjust the APL valve, the scale at 30cmH2O.
- Continued keep pressing the rapid oxygenation button, filling manual breathing bag. About 15 seconds, you should observe the physiological alarm, alarm trigger 【Sustained Airway Pressure】.
- Let the patient port through the atmosphere, prompt 【Sustained Airway Pressure】 alarm disappeared.

Respiratory apnea alarm test

- Manual / machine controlled switch to manually position, and manual breathing bladder connected to manual air bag interface of breathing circuit;
- Adjust the APL valve, adjusted to the scale 30cmH2O;
- Press the rapid oxygenation button, fill the breathing bag;
- Extrusion breathing bag, observe the bellows folding bag regular rising and falling 2 times;
- Stop squeezing the bag, wait for about 20s (asphyxia time limit setting);
- Should be observed, screen physiological alarm, alarm trigger 【Apnea】, if continued apnea time more than 2min,【Apnea】 alarm switch to alarm for 【Apnea>2 min】;
- Repeatedly pressing the breathing bag, observe the bellows folding bag regular rising and falling several times;
- Should be observed, prompt 【Apnea】 alarm or 【Apnea>2 min】 alarm disappeared .

Ppeak high alarm test

- Manual / machine control switch is arranged in the machine control position.
- Click on the 【Menu】 - > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【Ppeak Low Limit】: set to 0.1cmH2O; 【Ppeak High Limit】: set to 5cmH2O.
- Should be observed, screen physiological alarm, alarm trigger 【Ppeak Too High】.
- Click on the 【Menu】 - > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【Ppeak High Limit】: set to 40cmH2O.
- Should be observed, prompt 【Ppeak Too High】 alarm disappeared.

Ppeak low alarm test

- Manual / machine control switch is arranged in the machine control position.
- Click on the 【Menu】 -> 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【Ppeak Low Limit】: set to 2cmH2O; 【Ppeak High Limit】: set to 15cmH2O.
- Remove the breathing bag from the Y connector at patient.
- Waiting for 20 seconds, observe the screen alarm area, screen physiological alarm area, alarm trigger 【Ppeak Too Low】.
- The breathing bag is connected to the manual breathing bag connector on the circuit.
- Observe the screen alarm area, prompt 【Ppeak Too Low】 alarm disappeared.

Expired Volume alarm test

- Manual / machine control switch is arranged in the machine control position.
- Click on the【Menu】- >【Alarm Setup】interface, select【Alarm Limit】options, select【Vt Low Limit】: set to 200mL; 【Vt High Limit】: set to 400mL.
- should observe the screen physiological alarm, alarm trigger 【Vt Too High】.
- Click on the 【Menu】 - > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【Vt High Limit】: set to 1000mL.
- Should observe the screen alarm physiological District, prompting 【Vt Too High】 alarm.
- Click on the【Menu】- >【Alarm Setup】interface, select【Alarm Limit】options, select【Vt Low Limit】: set to 600mL; 【VtHigh Limit】: set to 1000mL.

- Should observe the screen alarm physiological District, alarm trigger 【Vt Too Low】.
- Click on the 【Menu】-> 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【Vt Low Limit】: set to 200mL; 【Vt High Limit】: set to 1000mL.
- Should observe the screen physiological alarm area, prompt 【Vt Too Low】 alarm disappeared.

Respiratory Frequency Alarm Test

- Manual / machine control switch is arranged in the machine control position.
- Click on the 【Menu】- > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select

【Rate Low Limit】: set to 4bpm;【Rate High Limit】: set to 10bpm.

- Should observe the screen physiological alarm, alarm trigger 【Rate Too High】.
- Click on the 【Menu】- > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【Rate High Limit】: set to 40bpm.
- Should observe the screen physiological alarm area, suggesting that 【Rate Too High】 alarm.
- Click on the 【Menu】- > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【Rate Low Limit】: set to 20bpm.
- Should observe the screen alarm physiological District, alarm trigger 【Rate Too Low】.
- Click on the 【Menu】- > 【Alarm Setup】 interface, select 【Alarm Limit】 options, select 【Rate Low Limit】: set to 4bpm.
- Should observe the screen alarm area, prompt 【Rate Too Low】 alarm disappeared.

Basic Setting

Boot system

- The power line is inserted into the AC outlet, should observe the display AC power indicator light and the battery indicator light.
- Press system on / off key, should observe the screen 【⏻】indicator light, into the self checking system.
- Alarm indicator light self test, is yellow and red flashes once one by one, also issued a "tick" sound tone.
- System self check ending, into the LOGO picture, the interface automatically pop-up detection results, click on the 【Continue】button to exit, and to enter the standby mode.

> ⚠**Notice：**
> 1) If self test appeared abnormal alarm, exit the self-test end interface, view alarm data, refer to the chapter " alarm information table" relevant content processing.
> 2) If you can't start, please do not use, contact equipment repair staff or the customer service department immediately.

Standby

- System boot, boot normally into standby.
- Non standby interface, click on the 【StandBy】 soft key, in the confirmation popup window select 【OK】, enter the standby state.
- On the standby screen, click on the 【StandBy】 soft key, in the confirmation popup window select 【OK】, you can exit the standby state.
- Standby mode, can do the ventilation mode setting, ventilation parameter modification, alarm settings and system settings.

Shut down system

- Long press system switch key, pop-up box to select 【OK】 button, enter the 5S interface countdown, countdown to the end, the system automatically shut down.
- Long press system switch key, pop-up box to select “ ☒ ” button, exit the interface, return the current state, the system cancel the shutdown.

Patient information setting

- Boot machine, patient type 【Previous Patient】, the default display as a previous patient information.
- Patient type setting: click on the 【New Patient】 - > patient selection: 【Adu】 or 【Ped】 or 【Neo】, Adu weight default is 75kg, the maximum is 150kg; the weight of Ped default to 10kg, the maximum is set to 18kg; Neo weight default is 1.5kg, the maximum is 5kg.
- Patient information input: patient selection: 【Adu】 or 【Ped】 or【Neo】, next to screen alarm silence logo click on the【Adu】or【Ped】 or 【Neo】,【Patient Info】window, enter information, click on the【start ventilation】set successfully, click on the【Previous Patient】is not successful.

Set fresh-gas

- Select N2O as carrier gas, press 【N2O】, selected for shallow green indicator.
- Select Air as carrier gas, press 【Air】, selected for shallow green indicator.
- Oxygen concentration set: click on 【O2%】 soft key, the pop-up window according to the arrow to do the left or right sliding, or press towards the arrow, numerical increase or decrease, after settings, click on the【✅】button to confirm, or click on the【❌】button to exit.
- Fresh gas flow setting: click on【Flow】soft key, the pop-up window according to the arrow to do the left or right sliding, or press towards the arrow, numerical increase or decrease, after settings, click on the 【✅】button to confirm, or click on the 【❌】 button to exit.

Set anesthetics

- Installation, please see the evaporator installation.
- Use the hands keep holding the 'O" key on the evaporator scale adjustment knob and counterclockwise rotation control knob, anesthetic concentration parameters needed until the knob on the value orientation scale position.

System setting

Set page

Large font selection

- Click on the 【Menu】 - > 【System Setup】 soft key, enter "System Setup" interface, select "Setting" option;
- Select the 【big Font】: on and off. Select the on as large font, off as the default font.

Pressure Unit display selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【Paw】;
- Select the 【Paw Unit】: cmH2O, KPa and mbar. Select cmH2O as the unit of pressure is cmH2O; KPa is the unit of pressure is KPa; mbar is the unit of pressure is mbar, the system default is cmH2O.

Volume of tidal selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【Volume】;
- Select the 【Vti Display】 : on and off. Select on as the inspiration tidal volume parameter display; off inspiration tidal volume parameters of shield, the system default is on.

Heat selection

- Click on the 【Menu】 - > 【System Setup】 soft key, enter "System Setup" interface, select "Setting" option;
- choose 【Heat】: on and off. Select on as start heating module; off as shielding heating module, the system default is on.

Demo selection

- Click on the 【Menu】 - > 【System Setup】 soft key, enter "System Setup" interface, select "Setting" option;
- choose 【Demo】: on and off. Select the on Demo mode; off is not Demo mode, the system default is off.

Light Switch

- If necessary, press top lamp switch (item 5 in Fig.1), top lamp (item 20 in Fig.1) is on, the system default is on.

Language selection

- Click on the 【Menu】 - > 【System Setup】 soft key, enter "System Setup" interface, select "Setting" option;

- Select 【Language】: English, Spanish and Chinese. Select the English system for the English language; Spanish system for the Spanish language; Chinese language for Chinese.
- After the system language settings, reboot the system, the choice of language to take effect.

Module

Module work selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【CO2】;
- Select the 【Operating Mode】: Measure and Standby. Select Measure in working mode for module; Standby module is in standby or hibernation mode, the system default is Measure.

CO2 Unit selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【CO2】;
- Select the 【CO2 Unit】 : mmHg, KPa and%. Select the mmHg CO2 unit is mmHg; KPa for CO2 is a unit of KPa, CO2 units is %, the system default is mmHg.

O2 compensation selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【CO2】;
- Select the 【O2 Compen】: Low, Mid and High. Such as oxygen concentration range: 0 ~ 30Vol% select Low; oxygenconcentration range: 30 ~ 70vol% select Mid; oxygen concentration range: 70 ~ 100Vol% High.

> ⚠**Notice：**
>
> If the equipment installing AG matching module, set the oxygen compensation, to ensure accurate enough CO2concentration monitoring. N2O compensation select OFF.

N2O compensation selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【CO2】;
- Select the 【N2O Compen】: on and off. Select on\off.

> ⚠**Notice：**
>
> If the equipment installing CO2 matching module, should respectively set oxygen and nitrous oxide compensation, to ensure accurate enough CO2 concentration monitoring.

Modul apnea alarm limit time selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【CO2】;

- Select the 【Apnea Delay】 : 20s, 25s, 30s, 35S and 40s. Select 20s, 25s, 30s, 35S and 40s.

> ⚠**Notice：**
>
> 1) Ventilation modes, suffocation alarm time the system defaults to 20s, the user can not be set.
>
> **2)** Manual mode, suffocation alarm time default 60s, to the user can not be set.

Wave

Pressure wave selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【Paw】;
- Select the【Wave Mode】:【 Fill 】and 【 Scan】. Select【 Fill 】 as the pressure wave display infilling form; Select【Scan】as the pressure wave display in scaning form, the system default is 【 Fill 】.

Volume wave selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【Volume】;
- Select the【Wave Mode】:【 Fill 】and 【 Scan】. Select【 Fill 】 as the pressure wave display in filling form; Select【Scan】as the pressure wave display in scaning form, the system default is 【 Fill 】.

Flow speed wave selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【Flow】;
- Select the【Wave Mode】:【 Fill 】and 【 Scan】. Select【 Fill 】 as the pressure wave display in filling form; Select【Scan】as the pressure wave display in scaning form, the system default is 【 Fill 】.

CO2 wave selection

- Touch waveform area (item 3 in Fig.6) to enter【Module Setup】interface, touch【CO2】;
- Select the【Wave Mode】:【 Fill 】and 【 Scan】. Select【 Fill 】 as the pressure wave display in filling form; Select【Scan】as the pressure wave display in scaning form, the system default is 【 Fill 】.

Wave color selection

- Click on the 【Menu】 - > 【System Setup】 - >【Screen】;
- 【Pressure wave】, 【volume wave】, 【CO2 wave】: red, green, blue, orange…. Default colour

of【Pressure wave】is pink, Default colour of【volume wave】is Cyan, Default colour of 【CO2 wave】is yellow.

- 【Flow wave】is orange, can not be choosed.

Set system time

- Click on the【Menu】- >【System Setup】soft key, enter "System Setup" interface, select "Time" option;
- Set 【Date】 and Time;
- The date format: YYYY-MM-DD, MM-DD-YYYY and DD-MM-YYYY, the system default is YYYY-MM-DD;
- Time Format: the system default is 24h;
- After setting, click on the 【Confirm】, time settings take effect.

> ⚠**Notice：**
>
> After setting the time, remember click 【Confirm】, otherwise it is set invalid.

Flow sensor drifting

- Click on the 【Menu】 - > 【Sensor parameter】 soft key;
- Click on the 【Start】soft key, zero calibration starts for about 1 minutes;

> ⚠**Notice：**
>
> When error between monitoring value and setting value of Vti and Vte is large, please do do zero calibration under the state of standby or non-standby.

Operation interface

Summary

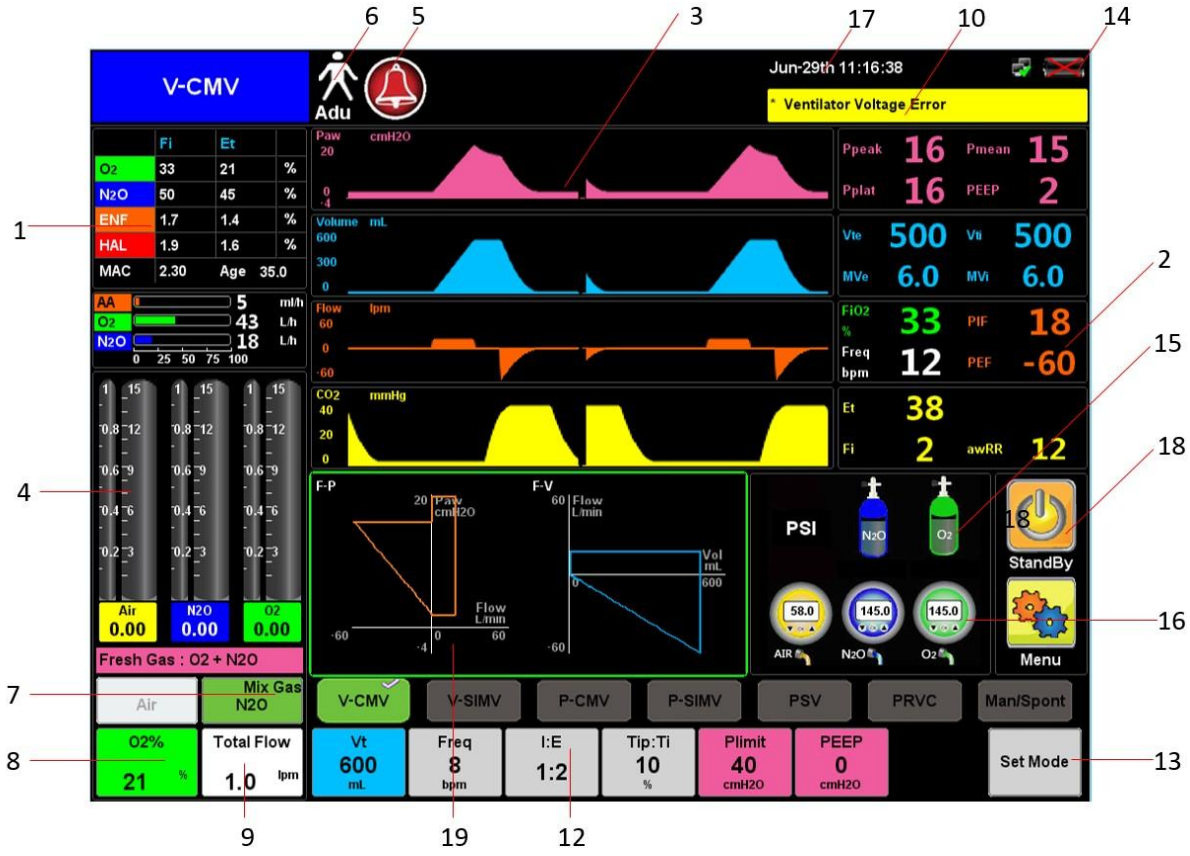
- According to the gas module and system function configuration, user interface display will be different, mainly reflected in the parameters and waveform display area.
- The user interface can be roughly divided into the following:

  ——Self test interface

  ——Standby interface

  ——Standard interface

  ——Large font interface



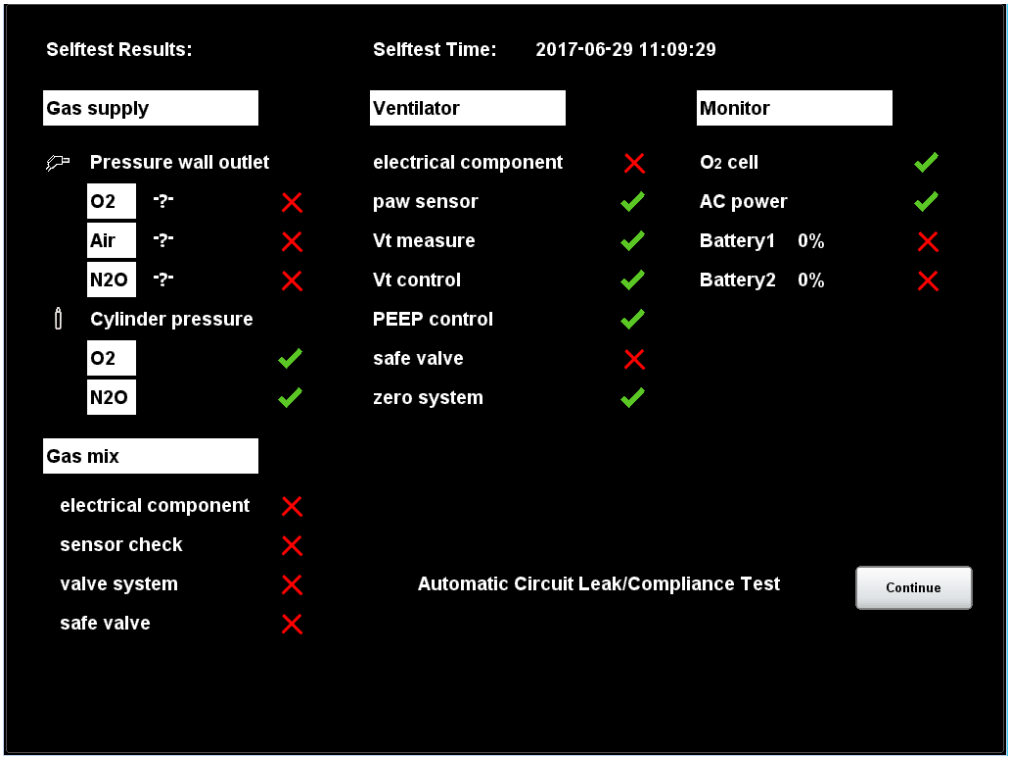
1 Display area for gas parametersmeasured
2 Physiological parameter monitoring area
3 waveform area
4 Gas flow display area
5 Alarm mute symbol
6 Patient type display area
7 the key for selecting mixed gas (N_2O or AIR)
8 FiO2 setting key
9 Total flow setting key
10 Alarm display area
11 Ventilation mode selection area
12 Ventilation parameter setting area
13 Mode confirmation key
14 Battery status display area
15 Cylinder pressure monitoring area
16 Pipeline gas pressure monitoring zone
17 Time display area
18 Functional softwave area

19 Loop display area

Fig.6 Display interface

Self test interface

- Press system on/off key, self test step will display on the screen. After finishing self-testing, jump out self test result interface automatically. As below:



- Testing result will be displayed in "✗"and"✓":

——"✗"：probably section components function does not connect, or re-self test after error check, district running.

——"✓"：self test accomplished successfully.

——【Auto Ventilation check】:Machine controlled ventilation leakage detection , operation see section "Mechanical ventilation respiratory loop leakage test".

——【Manu Ventilation check】:Manual controlled ventilation leakage detection , operation see section "Manual ventilation respiratory circuit leakage test".

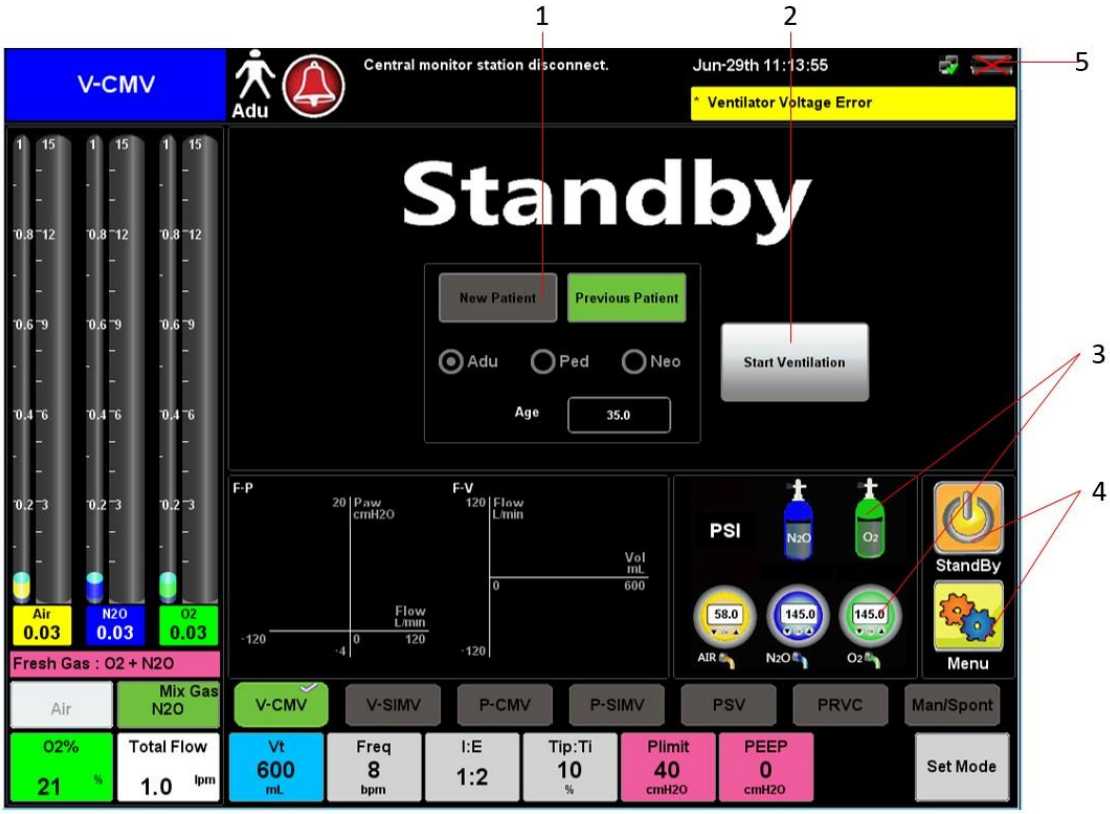
——【Exit】：exit self test interface, enter into the standby interface.

Notice：

When display"✗",exit this interface,enter into standby interface to check the technical alarm information,then correct the mistake and back to self test, use the device after self test passed.

Standby interface

- Press the key of the system switch, the system starts to enter the self-test screen, pop-up test results after finish the self-test , then click the 【Exit】 button to enter standby interface, or the work running state, click 【StandBy】 soft key ,pop-up prompt window to select 【OK】 to enter the standby interface, the standby interface as shown:



1.Patient type setting: 【Adu】、【Ped】、【Neo】Default 【Previous Patient】 as the latest patient who used the anesthesia system, re-set the patient type, click 【New Patient】 button, operable button background color is light green, inoperable Button background color is gray.

2.【Start Ventilation】button: Click this button to switch the standby mode to ventilation mode; or click 【StandBy】button, pop-up prompt window and select 【OK】 to enter the ventilation mode.

3.Gas supply pressure monitoring: Include the pressure of pipes and spare cylinders monitoring.

4.Function soft keys: at below the right side of the screen:【StandBy】and 【Menu】.

5. System time, status display for battery and AC connection status.

- In standby mode, the system will have the following changes:

——Ventilator stop delivering fresh gas.

——Can set the fresh gas flow rate, ventilation mode, ventilation parameters, alarm limit and system basic information. When you exit the standby state, the system will work according to the last setting in the standby state.

——Physiological parameter alarm will be automatically closed. If technical alarm occurs, the

alarm function will be shown normally.

——Turn off the monitoring parameters and waveform display, the system enter standby state.

——Gas module access will be on standby.

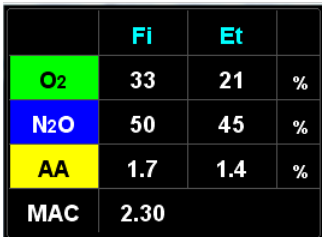
——Exit standby mode: In standby mode, you can press【StandBy】soft key and in the pop-up prompt window select 【OK】 to make anesthesia system out of standby state.

Standard interface

Interface gas module, fresh gas flow, parameters, waveforms, ring chart and ventilation parameters softkeys and other display areas, generally are divided into area A1, area A2, area B1, area B2, area B3, area B4, area C , area D, area E, area F, area G, area H, area K, area L and area M.

<table>
<tr><td rowspan="2">area M</td><td rowspan="2">area D</td><td colspan="3">area H</td></tr>
<tr><td colspan="3">area L</td></tr>
<tr><td rowspan="2">area A1</td><td rowspan="4" colspan="2">area C</td><td colspan="2">area B1</td></tr>
<tr><td colspan="2">area B2</td></tr>
<tr><td rowspan="4">area A2</td><td colspan="2">area B3</td></tr>
<tr><td colspan="2">area B4</td></tr>
<tr><td colspan="2">area E</td><td>area F</td><td>area K</td></tr>
<tr><td colspan="4">area G</td></tr>
</table>

- Area A1: Module gas monitoring parameters:



——FiO2: Inhaled oxygen concentration

——EtO2: Exhaled oxygen concentration

——FiN2O: Inhaled nitrous oxide concentration

——EtN2O: Exhaled nitrous oxide concentration

——FiAA: Inhaled anesthetic gas concentration（AA represents anesthetic）

——EtAA: Exhaled anesthetic gas concentration（AA represents anesthetic）

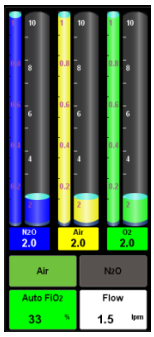
——MAC: Minimum alveolar effective concentration

- Area A2: Fresh gas flow and oxygen concentration set：

——【Air】、【N2O】soft key are used to select which kind of gas to mixed with oxygen to get a fresh mixture.

——【Auto FiO2】soft key is used to set oxygen concentration. Click it,popup settings

window,slide in the direction of the indication arrow,to the right is increase,to the left is reduce;or long press“”value also increased,long press“”value reduced.After confirmed the settings,press【】confirm successfully,otherwise【】setting unsuccessfully, and quit.



——【Flow】soft key,for setting the fresh gas flow rate. Click it, popup settings window, slide in the direction of the indication arrow, to the right is increase, to the left is reduce; or long press “” value also increased, long press “” value reduced. After confirmed the settings, press【】confirm successfully, otherwise【】setting unsuccessfully, and quit.

——Bar graph (the virtual flow tube) are nitrous oxide, air and oxygen.

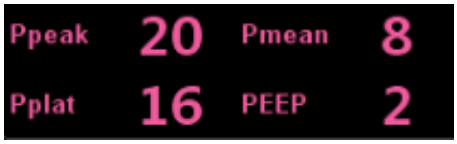
- Area B1: Pressure parameters:

——Ppeak：Peak airway pressure

——Pplat：Plateau pressure

——Pmean：The average pressure

——PEEP：positive end-expiratory pressure



- Area B2: Volume parameters:

——Vte：Exhaled tidal volume

——Vti：Inhaled tidal volume

——MVe: Exhaled minute ventilation

——MVi: Inhaled minute ventilation

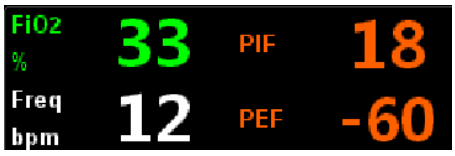
- Area B3: Volume parameters:

——FiO2：Oxygen concentration

——Freq：Frequency

——PIF: Inspiratory phase flow

——PEF：Expiratory phase flow



- Area B4: module CO2 gas monitoring parameters:

—— EtCO2: Exhaled CO2 gas concentration

——FiCO2: Inhaled CO2 gas concentration

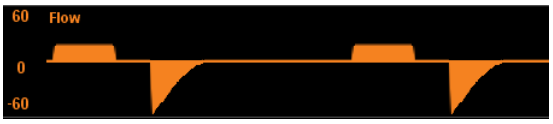
——awRR：Frequency of respiratory airway

- Area C: Area C is the waveform area. According to different user configuration, the combination of display is different. Area C may display the waveforms as follow:

——Pressure waveform

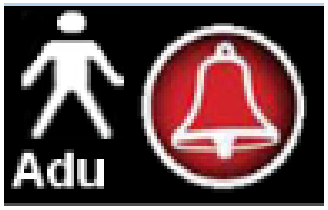
——Volume waveform

——Flow waveform



——CO2 waveform

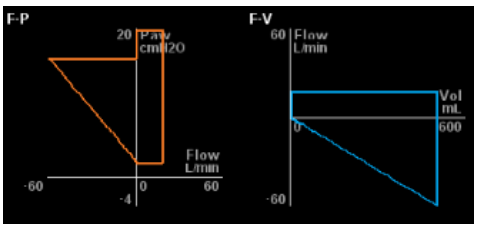
- Area D: the patient type setting and the alarm sounds pause area:



——【】Alarm sound suspended soft key: trigger alarm, click this button, the icon turn into【】, and in the physiological alarm area display mute countdown 120s. If the countdown ends or not ends click【】or occur new alarm,the alarm sound pause cancel, and the icon from【】turn into【】.

——【Adu】: Display patient types.

- Area E: Lung function ring graph:



——Lung function ring graph is divided into【F-P】(Flow rate - pressure ring)、【F-V】(Flow rate - volume loop) and【P-V】(Pressure- volume loop. Click in the acyclic graph area, expand the prompt menu, select the desired observation acyclic graph, click 【Save Loop】button.

- Area F: Area F is the display area of gas source pressure monitoring, divided into pipe, spare cylinders of gas source pressure monitoring:

——spare cylinders of gas source pressure monitoring: Nitrous oxide and oxygen, pressure unit MPa.

——pipe gas source pressure monitoring: Nitrous oxide, air and oxygen, pressure unit MPa.

- Area G: Area G is ventilation mode and parameter setting softkeys, according to different machinery ventilation modes, the soft key and it's arrangement in the parameter setting softkey area will be different. Specific parameter settings softkey operation, see Chapter "Machinery ventilation mode".

——Parameter setting, for example "PEEP" parameter setting.

——【PEEP】Soft key：Click it, popup settings window, slide in the direction of the indication arrow, to the right is increase, to the left is reduce; or long press"➡"value also increased, long press"⬅"value reduced. After confirmed the settings, press【✓】confirm successfully, otherwise【✗】setting unsuccessfully, and quit.

⚠Notice：

1) Other parameters' setting operation is consistent with the PEEP parameter operation setting.
2) There are interdependencies between parameters, when one parameter changes, the same parameter adjustment range will vary in other parameters.

- Area H: Area H is display the battery status and system time.
- Area K: Area K is menu display area, respectively 【StandBy】、【Menu】.

——【StandBy】soft key：operating status, press【StandBy】button, popup the prompt window and select【OK】, switching to standby status; standby status, press【StandBy】button, popup the prompt window and select【OK】, exit standby mode.

——【Menu】soft key: press【Menu】button, expand the sub-menu, then press sub-menu key to enter the sub-menu pages.

- Area L: Area L is physiological alarm and technical alarm display area.

——【Physiological alarm display】: Display Physiological alarm information.

——【Technical alarm display】: Display technical alarm information.

- Area M: Area M is the current status display

——【 

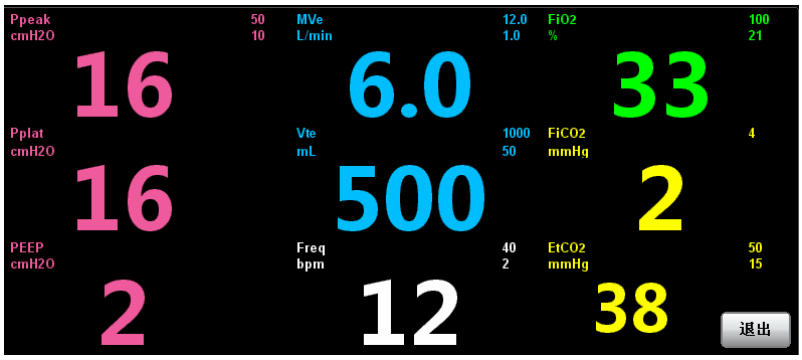
】: Display patient's basic information.

large font interface

- large font interface, parameters display as below:

——parameters on the interface are：Ppeak、Pplat、PEEP、MVe、Vte、FiCO2、EtCO2、FiO2;

——click【Exit】button, exit large font interface.

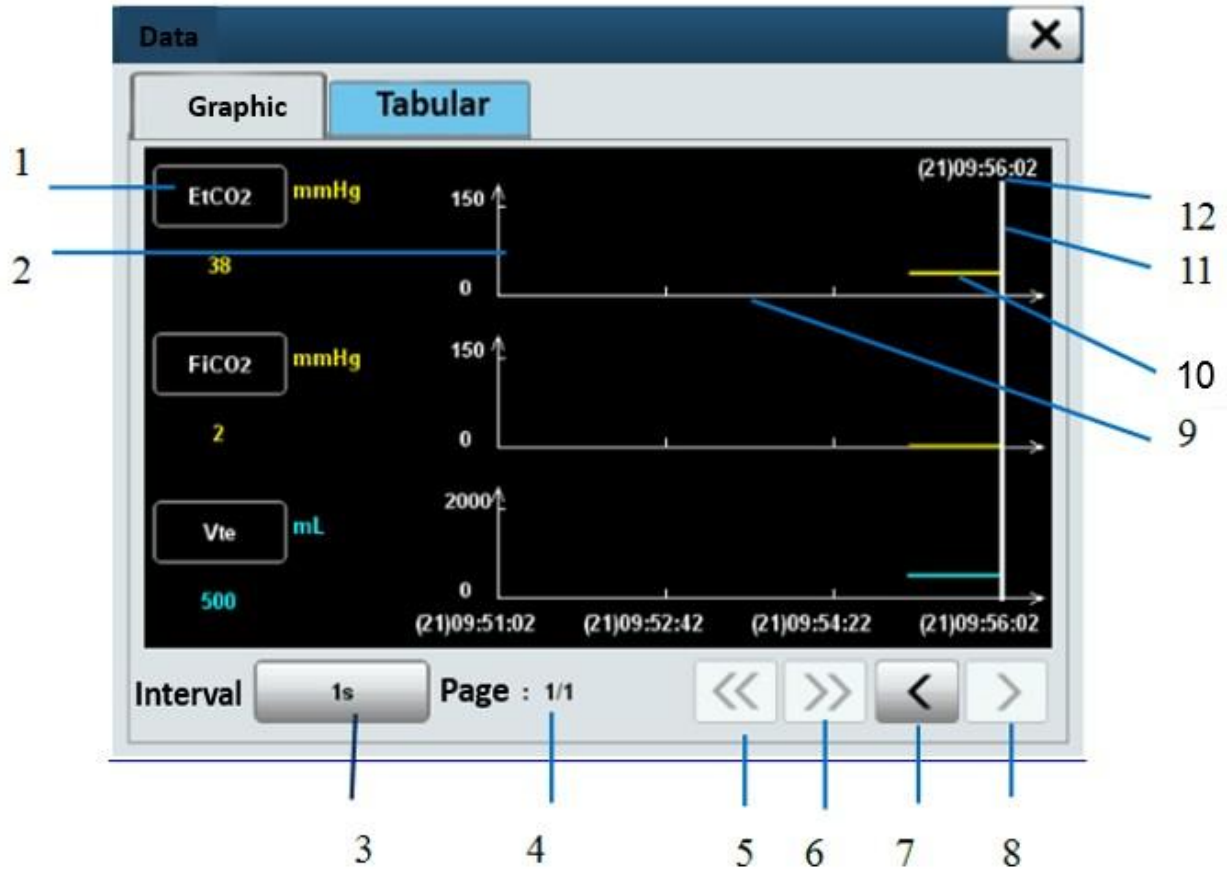


Ventilation and parameter settings

Trends

- Trend chart is used for reviewing of the parameter values changing trend in corresponding time, which is described the changes of the parameter's measurement results, the value of each point in the line corresponds to the time for each of the physiological parameters. Trends provide parameters: Vte、Vti、MVe、Mvi、Ppeak、Pplat、Pmean、PEEP、Cydn、EtCO2、FiCO2、、FiN2O、EtN2O、PEF、PIF、FiO2、Raw、Freq、FiDES、EtDES、FiSEV、EtSEV、FiISO、EtISO、FiENF、EtENF、FiHAL、EtHAL、awRR. Trends will be re-recorded after re-starting the machine.

- Click the bottom at the right corner of the screen 【Menu】 -> 【Data】 -> 【Graphic】, you can enter the trend interface, as shown below:

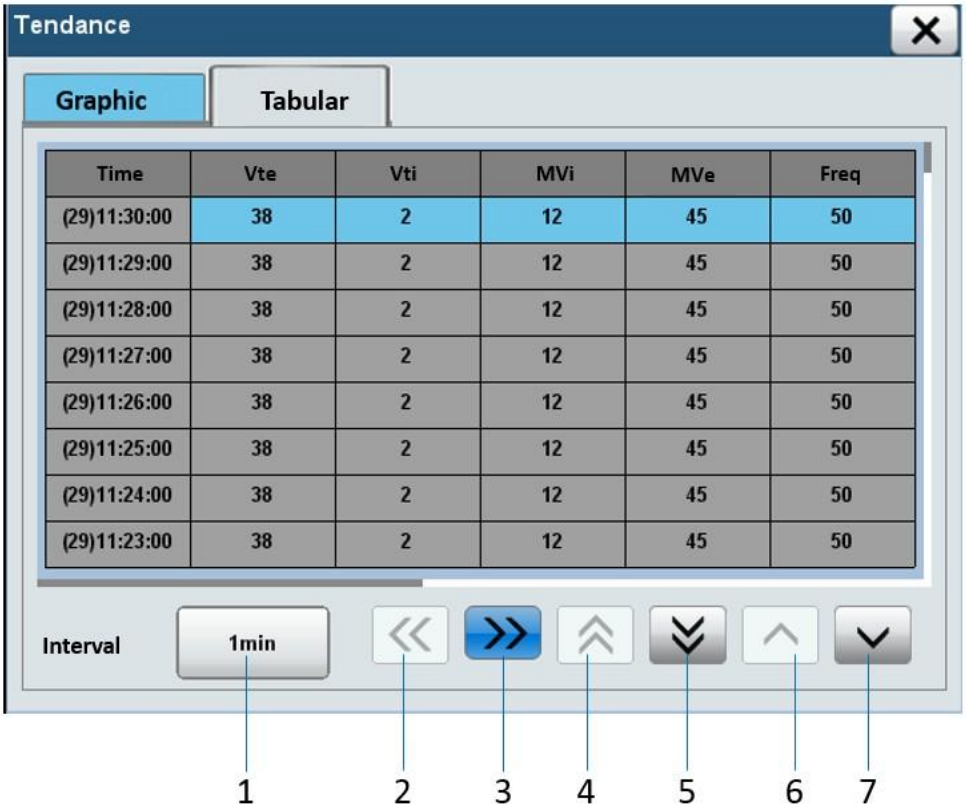


1 Parameter selection frame
2 Ordinate
3 Resolution（1s、5s、1min、10min、30min、60min）
4 Displays the current pages / total pages
5 Turned Previous
6 Next turn
7 Left
8 Right
9 Abscissa
10 Trend curve
11 Cursor
12 Cursor time

Trends table

- Trend table is used for reviewing the parameter data of corresponding time point, which will be described in the form of table of changes of the parameter's measurement results. Trends table provides a record of parameters: Vte、Vti、MVe、Mvi、Ppeak、Pplat、Pmean、PEEP、Cydn、EtCO2、FiCO2、、FiN2O、EtN2O、PEF、PIF、FiO2、Raw、Freq、FiDES、EtDES、FiSEV、EtSEV、FiISO、EtISO、FiENF、EtENF、FiHAL、EtHAL、awRR. Trend tables will be re-recorded after re-starting the machine.

- Click the bottom at the right corner of the screen 【Menu】 -> 【Data】 -> 【Tabular】, you can enter the trend table interface, as shown below:

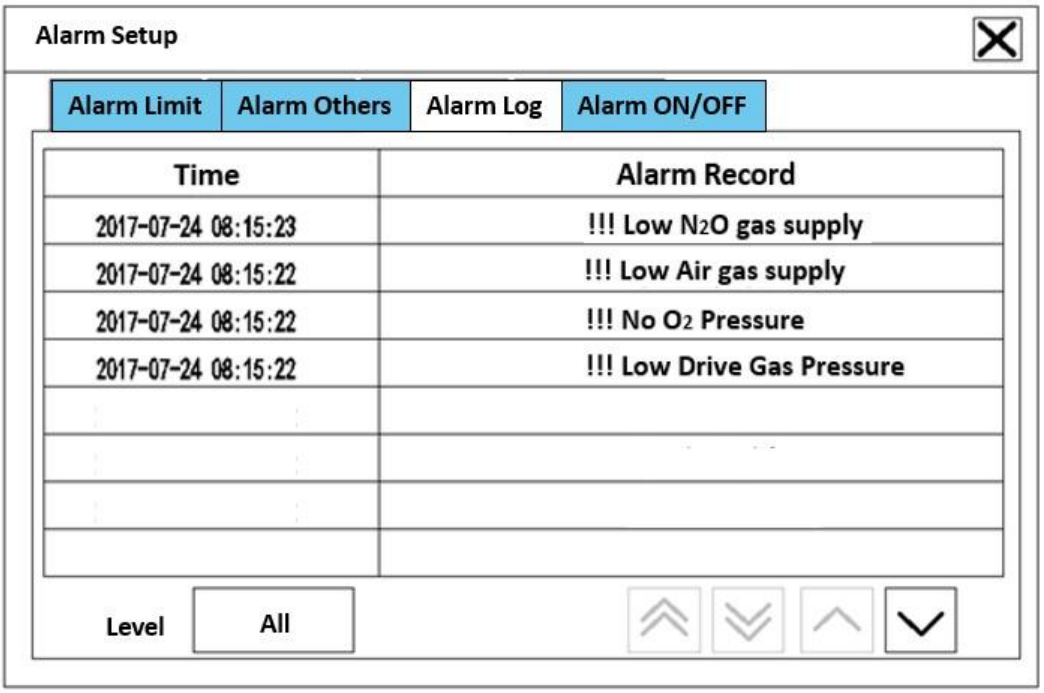


1 Resolution（1s、5s、1min、10min、30min、60min）
2 Left
3 Right
4 1st page
5 last page
6 previous line
7 next line

Alarm Log

- Alarm log record the trigger alarm event, including time, alarm levels and events. Logging in chronological order of the alarm to store, the latest incident occurred in front of a record, the log can record 500 messages, if it exceeds 500 messages, the earliest messages will be covered. And it could be paged display.

- Click the at the right corner of the screen 【Alarm】 -> 【Alarm Setup】 -> 【Alarm Log】, you can enter the alarm log screen, as shown below:



- Interface options, as follows:

—— Click 【All】: Expand options are: 【All】, 【Low】, 【High】, 【Mid】. If you selecte 【All】 displays all-level alarm messages; 【Low】 show only low-level alarm messages; 【High】 show only high-level alarm messages; 【Mid】 show only medium level alarm messages

—— Click on 【 】, turn to the first page

——Click on 【 】, turn to the last page

—— Click on 【 】, move the cursor to the previous line

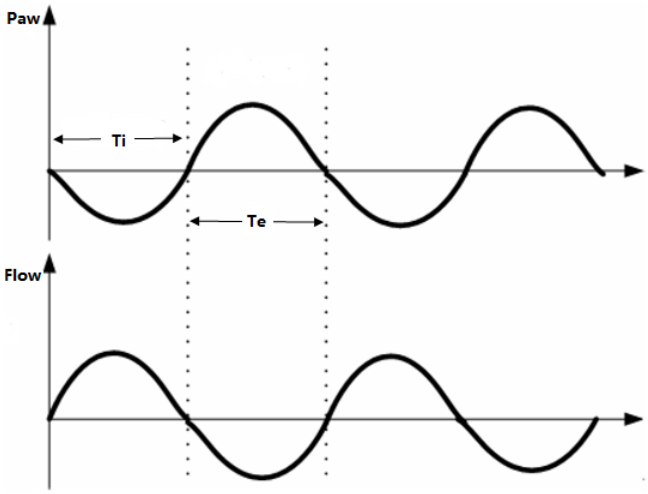
——Click on 【 】, move the cursor to the next line

Notice:

After powering off Anesthesia system or in case of power failure, alarm log will be canceled.

Spontaneous breathing mode

- Centered at the bottom of the screen, press【Man/Spont】soft key.
- Turn manual / machine control switch to the manual position and adjust APL valve to the MIN position (APL in the fully open state).
- spontaneous breathing mode, pressure and flow waveforms schematic as below:

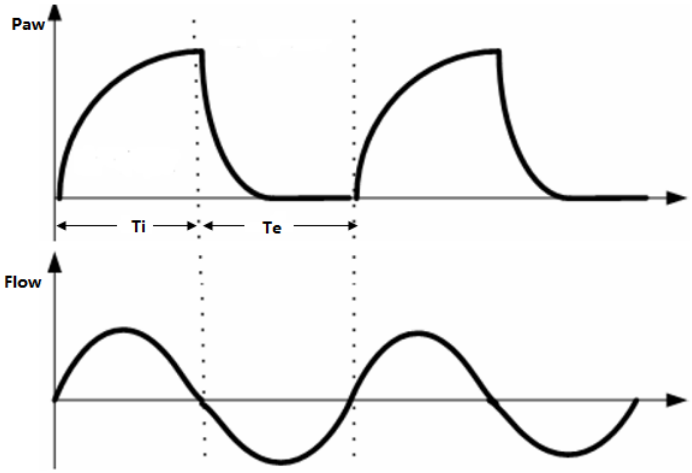


Notice：

The waveform only as a schematic,is not the same with the display on the device screen.

Manual ventilation mode

- Turn manual / machine control switch to the manual position, and press【Man/Spont】soft key,in the ventilation prompt area the system display【Manual】.
- Set the pressure limit of APL valve, generally set between 20 ~ 30cmH2O.
- Connect the manual breathing bladder to the port of gas pocket.
- Use hand to pinch the breathing bladder to ventilate with the patient.
- Manual ventilation mode, pressure and flow waveforms schematic as below:



Machinery ventilation mode

Settings before start the Machinery ventilation mode

- Set the machine in standby mode.
- In the ventilation parameter settings soft key area, set the applicable【Plimit】value.
- Check the status of ACGO switch, make sure ACGO is in off status.
- Check the spare oxygen flow meter control, if it is working properly.
- Manual / machine control switch setting is on the machine control position.
- If necessary, press the flush oxygenation button 【O2+】, inflate the folding bags of bellows.

V-CMV mode

- Select【V-CMV】mode:

  ——centered at the bottom of the screen,select【V-CMV】->【Set Mode】,the system in the ventilation mode prompt area display【V-CMV】.

- 【V-CMV】mode, the parameters need to set are below:

  ——【Vt】：Tidal volume

  ——【Freq】：Breathing rate

  ——【I:E】: Breathing ratio

  ——【Tip:Ti】：Percentage of inspiratory pause (to improve the gas distribution in the patient's lungs)

  ——【Plimit】：Pressure limit level (to avoid high airway pressure harm the patient)

  ——【PEEP】：positive end-expiratory pressure（can increase oxygenation in the breathing process, improve end-tidal carbon dioxide emissions）

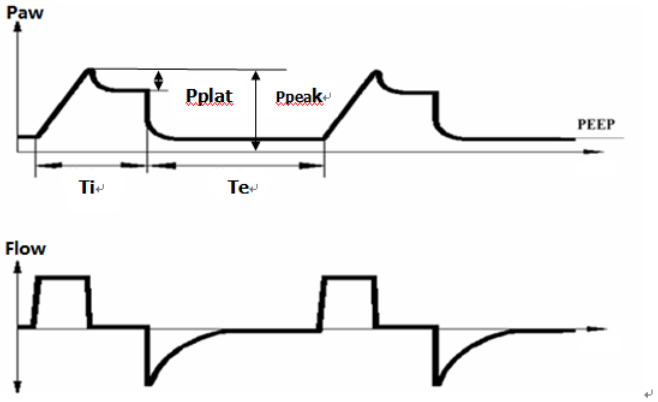
- Introduction of the principle:

  ——V-CMV（volume control）mode is a basic full machinery ventilation mode.

  ——In patient breathing phase, anesthesia system in accordance with pre-set【Vt】、【Freq】and 【I:E】 parameter values to use a constant aspirated speed to delivery the fresh gas into the patient's lungs, so that the【Vt】can reach the pre-set value during the patient breathing time; then the patient begins to exhale, after the expiration time, turn into inhale, cycle like this.

  ——Under V-CMV mode,Tidal volume compensation function is based on actual monitoring of exhaled tidal volume to adjust aspirated flow ,in order to compensate the tidal volume loss that circuit compliance bring.Turn on tidal volume compensation function, in order to ensure accurate tidal volume delivery

- 【V-CMV】mode,pressure and flow waveforms schematic as below:



V-SIMV mode

- Select【V-SIMV】mode:

  ——centered at the bottom of the screen,select【V-SIMV】->【Set Mode】,in the ventilation mode prompt area the system display【V-SIMV】.

- 【V-SIMV】mode,the parameters need to set are below:

  ——【Vt】: Tidal volume

  ——【Freq】: Breathing rate

  ——【Tinsp】: Inspiratory time

  ——【Tip:Ti】: Percentage of inspiratory pause (to improve the gas distribution in the patient's lungs)

  ——【Trigger】: Trigger

  ——【Tslope】: Pressure rise time

  ——【Plimit】: Pressure limit level (to avoid high airway pressure harm the patient)

  ——【PEEP】: positive end-expiratory pressure（can increase oxygenation in the breathing process, improve end-tidal carbon dioxide emissions）

  ——【Trig Window】: Trigger window

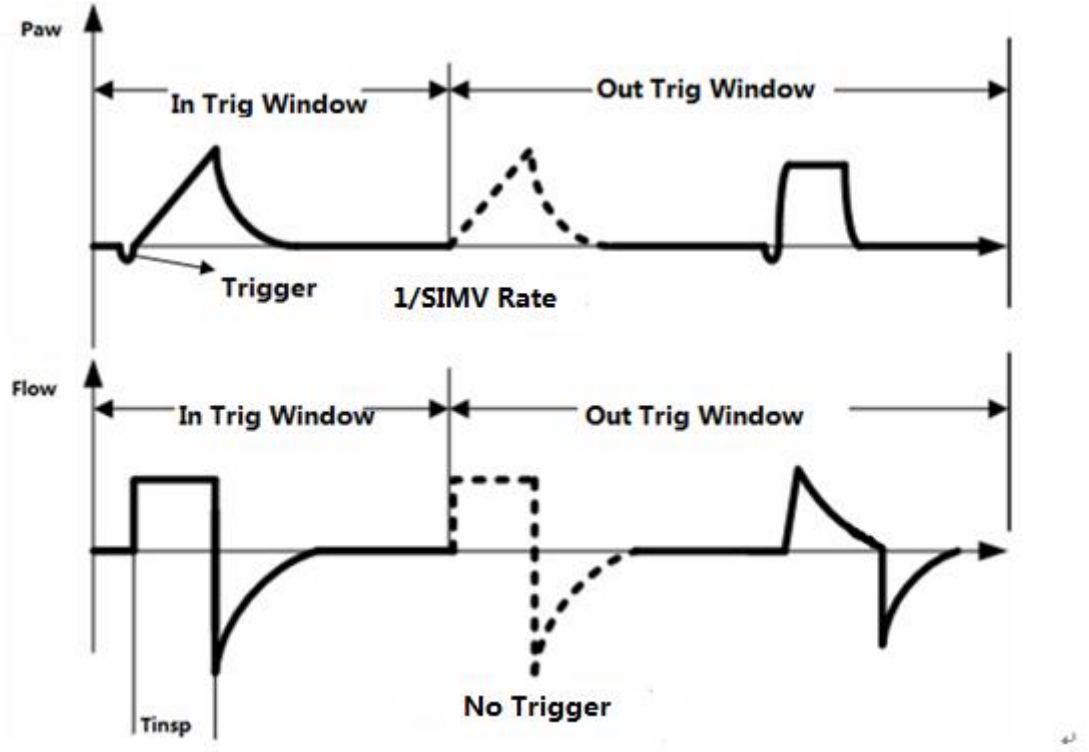
  If need to conbine with【PSV】ventilation mode to use,also need to set:

  ——【Psupp】: Pressure support

- Introduction of the principle:

  ——V - SIMV mode is a kind of synchronizing intermittent mandatory ventilation mode for forced ventilation through using the V-CMV.V-SIMV mode devided into inside the trigger window and outside the trigger window. As long as the system monitoring achieved the pre setted inspiratory trigger level (pressure trigger or flow trigger) in the trigger window, it triggers a machinery ventilation;if monitoring does not achieved the pre setted inspiratory trigger level in the trigger window, at the end of the synchronization trigger window , the system will conduct a mandatory V-CMV macninery ventilation automatically. If the setting allow to to use with PSV mode,outside triggerwindow monitored the airway pressure achieved the pre settedinspiratory trigger level , you can start PSV mode ventilation.

- 【V-SIMV】mode, pressure and flow waveforms schematic as below:



P-CMV mode

- Select P-CMV mode:

  ——centered at the bottom of the screen,select【P-CMV】->【Set Mode】,in the ventilation mode prompt area the system display【P-CMV】.

- 【P-CMV】mode, the parameters need to set are below:

  ——【Pinsp】：Inspiratory pressure

  ——【Freq】：Breathing rate

  ——【I:E】：Breathing ratio

  ——【Tslope】：Pressure rise time

  ——【Plimit】：Pressure limit level (to avoid high airway pressure harm the patient)

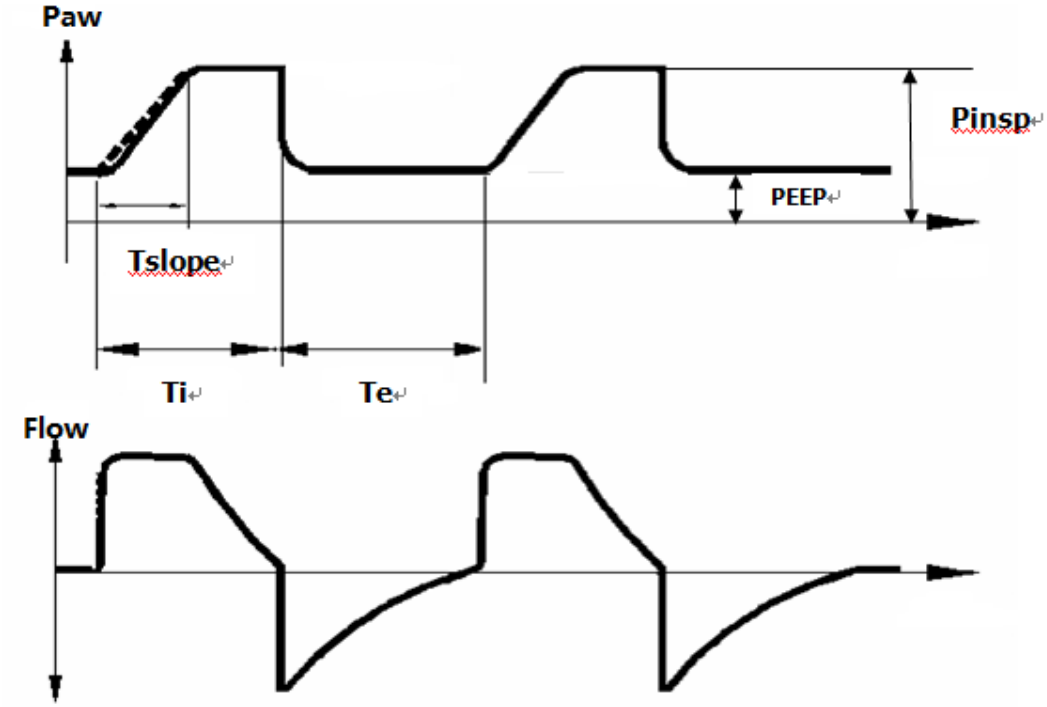
  ——【PEEP】：positive end-expiratory pressure（can increase oxygenation in the breathing process, improve end-tidal carbon dioxide emissions）

- Introduction of the principle:

  ——P-CMV（Pressure control）mode is a basic fully machinery ventilation mode.

  ——During the patient inhale phase,the anesthesia system according to the pre setted【Pinsp】、【Freq】and【I:E】parameter values, in a fast speed to delivery the fresh gas the the lungs of the patient; When reached the【Pinsp】pre setted value, the anesthesia system reduce the speed, keep the【Pinsp】pre setted value, until the patient inhale phase finished, then start the patient exhale phase.

- 【P-CMV】mode, pressure and flow waveforms schematic as below:



P-SIMV mode

- Select【P-SIMV】mode:

——centered at the bottom of the screen,select【P-SIMV】->【Set Mode】,in the ventilation mode prompt area the system display【P-SIMV】.

- 【P-SIMV】mode, the parameters need to set are below:

——【Pinsp】: Inspiratory pressure

——【Freq】: Breathing rate

——【Tinsp】: Inspiratory time

——【Trigger】: Trigger

——【Tslope】: Pressure rise time

——【Plimit】: Pressure limit level (to avoid high airway pressure harm the patient)

——【PEEP】: positive end-expiratory pressure（can increase oxygenation in the breathing process, improve end-tidal carbon dioxide emissions）

——【Trig Window】: Trigger window

If need to conbine with【PSV】ventilation mode to use,also need to set:

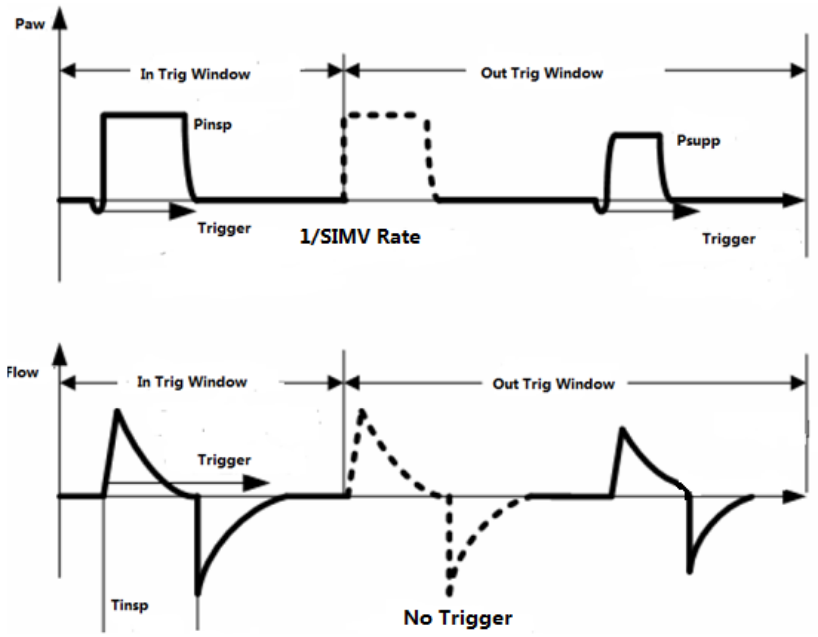
——【Psupp】: Pressure support level

- Introduction of the principle:

——P-SIMV mode is a kind of synchronizing intermittent mandatory ventilation mode for forced ventilation through using the P-CMV.P-SIMV mode devided into inside the trigger window

and outside the trigger window. As long as the system monitoring achieved the pre setted inspiratory trigger level (pressure trigger or flow trigger) in the trigger window, it triggers a machinery ventilation;if monitoring does not achieved the pre setted inspiratory trigger level in the trigger window, at the end of the synchronization trigger window , the system will conduct a mandatory P-CMV macninery ventilation automatically. If the setting allow to to use with PSV mode,outside trigger window monitored the airway pressure achieved the pre setted inspiratory trigger level , you can start PSV mode ventilation.

- 【P-SIMV】mode, pressure and flow waveforms schematic as below:



PSV mode

- Select【PSV】mode:

——centered at the bottom of the screen, select【PSV】->【Set Mode】,in the ventilation mode prompt area the system display【PSV】.

- 【PSV】mode, the parameters need to set are below:

——【Psupp】：Pressure support level

——【FreqMin】: Spare minimum breathing rate

——【Tslope】：Pressure rise time

——【Trigger】：Trigger level

——【Plimit】：Pressure limit level (to avoid high airway pressure harm the patient)

——【PEEP】：positive end-expiratory pressure（can increase oxygenation in the breathing process, improve end-tidal carbon dioxide emissions）

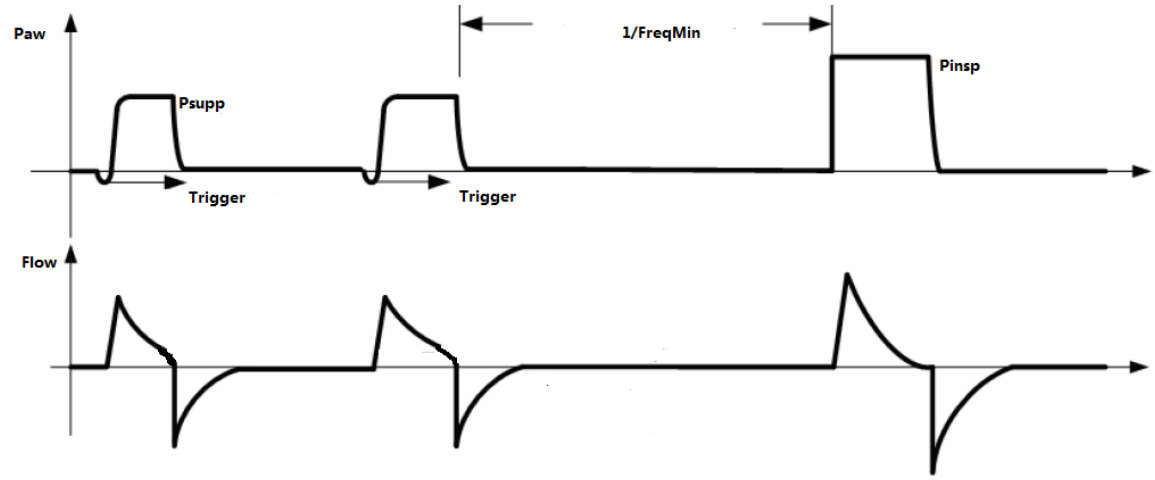
- The principle description:

——PSV（Pressure support）mode is a ventilation mode that auxiliary respiration mode,it is based on the patient’s autonomous respiration,then combine the ventilator to achieve scheduled inhale positive airway pressure.

——【PSV】ventilation mode must be triggered by patients with autonomous respiration,so when you start this mode you should set well spare PCV mandatory ventilation mode.When the patient autonomous respiration can not achieve【Trigger】, or without autonomous respiration, as long as achieved【FreqMin】,then can start PCVmandatory ventilation mode to ventilate to the patient automatically.Under【PSV】mode, a breath process in accordance with the time switch into inspiratory and expiratory phase. During the patient's inspiratory phase, it's autonomous inspiratory achieved the expectant inhale trigger level, will trigger the ventilator to delivery gas with inspiratory flow speed：First promote the air way pressure to the expectantPsupp（Pressure support）level, then under the system control reduce the speed and to keep the Psupp（Pressure support） level, until the patient inhale phase finished, then start the patient exhale phase.

——Vt（Tidal volume）under PSV mode changing constantly, so there is no need to set.

- 【PSV】mode,pressure and flow waveforms schematic as below:



PRVC mode

- Select【PRVC】mode:

——centered at the bottom of the screen,select【PRVC】->【Set Mode】, in the ventilation mode prompt area the system display【PRVC】.

- 【PRVC】mode, the parameters need to set are below:

——【Vt】：Tidal volume

——【Freq】：Breathing rate

——【I:E】：Breathing ratio

——【Tslope】：Pressure rise time

——【Plimit】：Pressure limit level (to avoid high airway pressure harm the patient)

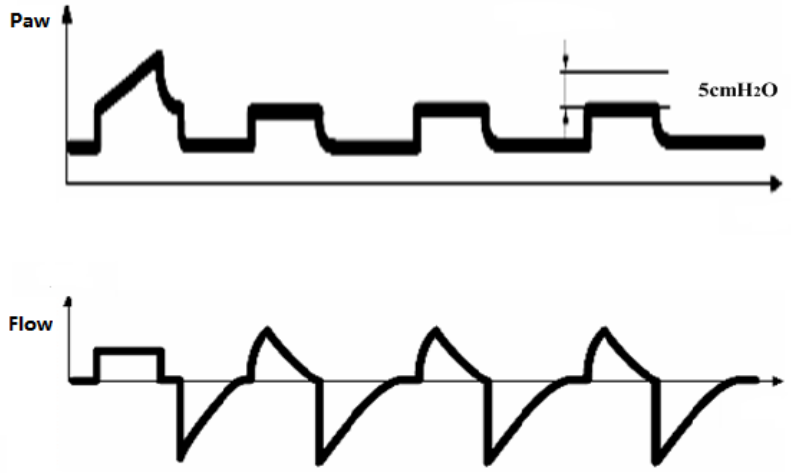
——【PEEP】：positive end-expiratory pressure（can increase oxygenation in the breathing process, improve end-tidal carbon dioxide emissions）

- Introduction of the principle:

——【PRVC】mode Is a kind of pressure regulating volume control ventilation mode.

——【PRVC】 as a tidal volume to guarantee control ventilation, this ventilation are done by the regulation of pressure control level.Every time enter PRVC mode,the first period all conduct a tentative ventilation（V-CMV mode）. Pplatmeasured in the tentative ventilation period as the goal pressure of the next ventilation, each period according to the difference monitored between tidal volume and setted tidal volume to calculate the target pressure in next ventilation period .

- 【PRVC】mode,pressure and flow waveforms schematic as below:



Ventilator parameters setting

Notice：

1) If you need to adjust some parameter you must confirm it first.If you want to regain the previous setted value,you need to reset it.
2) If some parameter adjusted exceed the reasonable range,the system will show a prompt message.

Set the Tidal volume

- Select【V-CMV】、【V-SIMV】or【PRVC】-> 【Vt】soft key.
- Popup the prompt setting window, use your finger presss the frame and slide to the right, the value gradually increase;slide to the left, the value gradually reduce;or long press【】and no release, the value gradually increase; long press【】and no release, the value gradually reduce; also you can press 【】or【】release, the value increaseor reduce one step length. Set【Vt】to the appropriate value.
- Press【】to confirm your setting take effect; press【】cancel setting and not take effect.

Set Breathing rate

- Select【V-CMV】、【V-SIMV】、【P-CMV】、【P-SIMV】or【PRVC】-> 【Freq】soft key.
- Popup the prompt setting window, use your finger presss the frame and slide to the right, the value gradually increase;slide to the left, the value gradually reduce; or long press【】and no release, the value gradually increase; long press【】and no release, the value gradually reduce; also you can press【】or【】release, the value increaseor reduce one step length. Set【Freq】to the appropriate value.

- Press【✓】to confirm your setting take effect; press【✗】cancel setting and not take effect.

Set Inspiratory time

- Select【V-SIMV】or【P-SIMV】->【Tinsp】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase; slide to the left,the value gradually reduce;or long press【→】and no release,the value gradually increase;long press【←】and no release, the value gradually reduce;also you can press【→】or【←】release,the value increaseor reduce one step length.Set【Tinsp】to the appropriate value.
- Press【✓】to confirm your setting take effect;press【✗】cancel setting and not take effect.

Set the pressure rise time

- Select【V-SIMV】、【P-CMV】、【P-SIMV】or【PRVC】->【Tslope】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【→】and no release,the value gradually increase;long press【←】and no release,the value gradually reduce;also you can press【→】or【←】release,the value increaseor reduce one step length.Set【Tslope】to the appropriate value.
- Press【✓】to confirm your setting take effect;press【✗】cancel setting and not take effect.

Set Breathing ratio

- Select【V-CMV】、【P-CMV】or【PRVC】->【I:E】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【→】and no release,the value gradually increase;long press【←】and no release,the value gradually reduce;also you can press【→】or【←】release,the value increaseor reduce one step length.Set【I:E】to the appropriate value.
- Press【✓】to confirm your setting take effect;press【✗】cancel setting and not take effect.

Set Pressure limit level

- Select【V-CMV】、【V-SIMV】、【P-CMV】、【P-SIMV】、【PSV】or【PRVC】->【Plimit】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【→】and no release,the value gradually increase;long press【←】and no release,the value gradually reduce;also you can press【→】or【←】release,the value increaseor reduce one step length.Set【Plimit】to the appropriate value.
- Press【✓】to confirm your setting take effect;press【✗】cancel setting and not take effect.

Set Inspiratory pause

- Select【V-SIMV】or【V-CMV】->【Tip:Ti】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【➡】and no release,the value gradually increase;long press【⬅】and no release,the value gradually reduce;also you can press【➡】or【⬅】release,the value increaseor reduce one step length.Set【Tip:Ti】to the appropriate value.
- Press【✔】to confirm your setting take effect;press【✖】cancel setting and not take effect.

Set PEEP

- Select【V-CMV】、【V-SIMV】、【P-CMV】、【P-SIMV】、【PSV】or【PRVC】->【PEEP】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【➡】and no release,the value gradually increase;long press【⬅】and no release,the value gradually reduce;also you can press【➡】or【⬅】release,the value increaseor reduce one step length.Set【PEEP】to the appropriate value.
- Press【✔】to confirm your setting take effect;press【✖】cancel setting and not take effect.

Set Inspiratory Pressure

- Select【P-SMC】or【P-SIMV】->【Pinsp】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【➡】and no release,the value gradually increase;long press【⬅】and no release,the value gradually reduce;also you can press【➡】or【⬅】release,the value increaseor reduce one step length.Set【Pinsp】to the appropriate value.
- Press【✔】to confirm your setting take effect;press【✖】cancel setting and not take effect.

Set Inspiratory trigger level

- Inspiratory trigger type,can select【Pressure】or【Flow】trigger.
- Select【V-SIMV】、【P-SIMV】or【PSV】->【Trigger】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【➡】and no release,the value gradually increase;long press【⬅】and no release,the value gradually reduce;also you can press【➡】or【⬅】release,the value increaseor reduce one step length.Set【Trigger】to the appropriate value.
- Press【✔】to confirm your setting take effect;press【✖】cancel setting and not take effect.

Set trigger window

- Select【V-SIMV】or【P-SIMV】->【Trig Window】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【  】and no release,the value gradually increase;long press【  】and no release,the value gradually reduce;also you can press【  】or【  】release,the value increaseor reduce one step length.Set【Trig Window】to the appropriate value.
- Press【  】to confirm your setting take effect;press【  】cancel setting and not take effect.

Set minimum frequency

- Select【PSV】->【FrerqMin】soft key.
- Popup the prompt setting window,use your finger presss the frame and slide to the right,the value gradually increase;slide to the left,the value gradually reduce;or long press【  】and no release,the value gradually increase;long press【  】and no release,the value gradually reduce;also you can press【  】or【  】release,the value increaseor reduce one step length.Set【FreqMin】to the appropriate value.
- Press【  】to confirm your setting take effect;press【  】cancel setting and not take effect.

Start Machinery ventilation

Notice：

Before start a new ventilation mode, please ensure all related parameters have been adjusted to appropriate value and check if the system configuration is correct.

- After setted all the related parameter values,click 【Start Ventilation】in the standby interface to quit the standby state and work as the setted the machinery ventilation mode.

Stop Machinery ventilation

- When you confirm to stop machinery ventilation,you can operate as following ways:

——Before stop machinery ventilation,adjust evaporator control valveto 0 position ,make sure the APL valve has setted to the appropriate position and the reathing bag installed to the port of manual storage airbag .

——Switch the Manual/ Mechanical control switch to the manual position,switch to manual ventilation then stop the machinery ventilation; or turn on ACGO, stop the machinery ventilation directly.

Notice：

After stop machinery ventilation, do not stop ventilate to the patient immediately, please select manual ventilation.Can move away the anesthesia system when the patient can breath autonomously.

Gas monitoring module

Summary

- The anaesthetic gas and carbon dioxide monitor are used during respiratory anesthesia of the surgery, for patient gas monitoring, used in adults, children, babies.

- Gas monitoring module transfers sampling data by sampling a small quantity of gas mixer at tracheal tubes of breathing circuit to sampling inlet of monitor, the module measure and analyze sample gas. Nomoline sampling pipe has a particular separating water area which has no relation with direction. This area attaches hydrophobic bacteria filter and is made of particular polymer, this area can remove the condensation water from the sampling gas or remove the water from the inhalation to avoid cross contamination for moisture enter monitor. The design of sampling pipe ensure that gas flow can be continuous and unblocked, so response time of measuring gas is very short.

- Gas monitoring module can monitor Enflurane, Isoflurane、Sevoflurane、Desflurance and Fluothane five kinds of anesthetic,Nitrous oxide and CO2.

⚠**Notice：**

1) The gas monitor used with this device shall comply with the standard of ISO 21647.If the anesthetic system doesn't configure anesthetic gas module or (and) CO2 module, please use the module that having anesthetic gas or (and) CO2 monior function which comply with relevant standard requirements to ensure the anesthetic system can realize the monitoring of anesthetic gas and CO2 in the meatime.

2) Rise to 10kPa periodic pressure doesn't affect the performance of gas monitor.

Minimum alveolar concentration

- MAC（minimum alveolar concentration）,mean minimum alveolar concentration,it's the basic indicator that reflect inhalation anesthetic concentration.Standard ISO 80601-2-55 for the definition of MAC: When there is no exist other anesthetic and achieve a balance, some alveolar concentration of anesthetic inhaled, the concentration can prevent 50% of patients' limb movements in a standard surgical stimulation.

- Using Tidal anesthetic gas concentration calculate and MACage display, calculated as follows:

  MAC=Et(AG1)%/X(AG1)+ Et(AG2)%/X(AG2)+Et(N2O)%/100

- Formula Et (AG1)% 、Et (AG2)%, respectively, on behalf of an inhaled anesthetic end-tidal concentration, Et (N2O)% on behalf of the end-tidal concentration of N2O. X (AG1) 、X (AG2) respectively on behalf of a corresponding MACage concentration values of the inhaled anesthetics: ENF=1.7%、ISO=1.15%、SEV=2.05%、DES）=6.0%,HAL=0.75%.

- For example,Anesthetic gas module monitored the end-expiratory gas of the patient contains 2.6%ISO、 4%ENF、42%N2O, so MAC=(2.6%/1.15%)+(4%/1.7%)+(42%/100)=5.0

⚠Notice：

Above formula does not consider the patient's age, personal factors and altitude.

Module setting

⚠Warning：

1) Side stream ISA module can only be used by trained or authorized medical staff.
2) ISA module can not be used in flammable anesthetic gas environment.
3) Use only with ISA module supporting PHASEIN Nomoline sampling tube.
4) To reduce the risk of bridling or entangleding the patient, be sure to carefully straighten out the sampling tube.
5) To avoid cross-infection, do not reuse disposable sampling tube.
6) The used disposable sampling tube should be disposed according to local medical waste disposal regulations.
7) Do not through Nomoline sampling tube apply negative pressure (such as using a syringe) to remove condensate.
8) Do not grab sampling tube to lift the ISA module or system components, or it may make off with the ISA module or system components, resulting in ISA module or system components fall on the patient.
9) To avoid the ISA module fall on the patient, please ensure it has been fixed when using.
10) After ISA adult / child model sampling tube access to circuit will increase the patient's dead space, and therefore prohibited for infants.
11) Do not use ISA infant sampling tube for adults, otherwise it will lead to excessive flow resistance.
12) If the collection of gas sample need to provide gas for breathing, always use bacteria filter in the exhaust side.
13) Ensure ISA module used in electromagnetic environment that this specification defined, in case of to be affected by mobile or portable communication devices.
14) ISA monitor or system uses high-frequency electro-surgical devices in the vicinity may cause interference, and led to incorrect measurements.
15) ISA monitor banned for MRI environment.
16) To avoid bacterial filter clogging, do not use ISA monitor and quantitative spray or spray together.
17) Check if the sample gas flow rate for given patient type is too high.
18) If the screen prompts Nomoline blockage information or the input port of ISA sampling tube is beginning to show red flash, replace the sampling tube.
19) Do not make any changes to the ISA module, If it has been changed, please do appropriate tests and inspections to ensure long-term safe operation.
20) Do not use ISA module external natural cooling function.
21) If the patient circuit's positive or negative pressure is too large,which may affect the sample

flow.

22) If the discharge suction pressure is too large, it may affect the sample flow.

⚠**Notice：**

1) Exhaust gases should be discharged into the drainage system.

2) ISA module is only designed as an auxiliary method to patient assessment. Please use it together with other vital signs and symptoms assessed equipment.

⚠**Notice：**

1) Do not stretch ISA monitor probe cable.

2) To avoid the damage to ISA monitor, should be ensure it has been fixed installed.

Set AG

- In standby state, click on the【Menu】->【Factory setting】soft key, popup password box,input the correct password,select【Enter】->【OK】key,enter【Maintain】interface.
- Select【Config】->【Gas module】->【AG 】option.

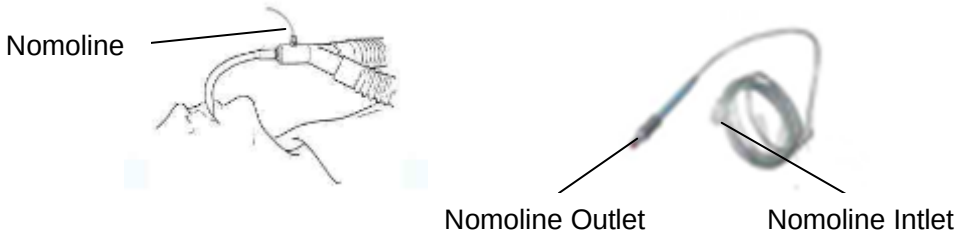
Set CO2

- In standby state, click on the【Menu】->【Factory setting】soft key, popup password box,input the correct password,select【Enter】->【OK】key,enter【Maintain】interface.
- Select【Config】->【Gas module】->【CO2 】option.

Operation

Istallation

- Make sure the anesthesia system is turned off, connect the communication port of ISA monitor with the module interface cable on the backboard of the anesthesia system ,see item 8 in Fig.4;
- Connect Nomoline sampling tube output port to the air inlet port of ISA monitor ;
- ISA monitor air outlet port ,use soft tube connect to AGSS system,discharge the exhaust gas together with AGSS;
- Connect Nomoline gas inlet port of sampling tube to the sampling port of the patient's breathing circuit;



- Press the system switch button,start the system;
- After LED flash on ISA monitor flashed sereval seconds turn to normally on means mearuring state.
- Sidestream module defaults to standby mode, when connected sidestream module,the screen will display【AG is sleeping】.
- Click CO2 waveform area(item 3 in Fig.6), select option CO2,【Operating Mode】->【Measure】.

Checking before using

Before connecting Nomoline sampling tube to the mask of the patient,please do the following checking:

- Ensure that the you have finished all related operations in Chapter " Installation" of "Operation" ;
- Exhale to the sampling tube to check if the monitoring interface of the anesthesia system has display valid CO2 waveform and value;
- Use your fingertip to block off the sampling tube,last 10 seconds,should observed on the anesthetic operation interface display "Please check the sampling tube", in the meantime the red LED light on the monitor flash;
- In appropriate situation, to check the patient breathing circuit and sealing of the connection of the sampling tube;
- After finish above steps, can connect the Nomoline sampling tube to the patients' mask or Y shaped connector.

⚠Notice：

1) To prevent contaminate operating room, make sure the sidestream gas outlet through the soft tube connected to the AGSS system.Discharge the exhaust together with AGSS.

2) The leak of sample gas will cause the measurement accuracy beyond specification; internal exhaust is not smooth, it may cause the monitor can not working properly. Therefore, we must ensure the correct connection.

Affecting factors of monitoring

- Effects of atmospheric pressure

——Use the percentage of the volume as the unit to reporte the gas concentration, at this time the measurement results are not affected by atmospheric pressure. Concentration is defined as follows：

%gas=Partial pressure of gas component/Total pressure of gas mixture*100.

——The total pressure of the mixed gas using the cup pressure sensor of ISA gas analyzer tomeasure.

——When the test result using partial pressure indicated that it is related with the current atmospheric pressure , need to be calculated based on the actual atmospheric that the analyzer sent, the following formula:

CO2（mmHg）=CO2 concentration×pressure from the ISA (kPa) ×(750/100).

——For example ： 5.0Vol%Co2(101.3kPa),according to the above method transfer ： 0.05×101.3×750/100=38 mmHg.

- Effects of moisture

——The partial pressure and the volume percentage of CO2、Nitrous oxide、O2 and Anesthetic depend on water vapor content.Calibrate theO2 measurement will display 20.8Vol% at the actual ambient temperature and humidity level, but not the actual partial pressure. 20.8Vol% O2 corresponding to the actual O2 concentration in the room (water concentration 0.7Vol%) (e.g., at 101.3kPa, corresponding to 25 ℃ and 23% RH). When measuring CO2, Nitrous oxide and O2(for example, all gas measured by the infrared pool) will always show the actual partial pressure in current humidity level.

——In patient's alveolar, water vapor in respiratory gas at body temperature achieved saturated (BTPS).

——After collected and put the breathing gas to the sampling tube,before the gas enter ISA sidestream monitor,it's temperature turn to close to ambient temperature.When Nomoline sampling tube remove all condensed water,the moisture will not enter ISA sidestream monitor.The relative humidity of the collected gas is about 95%.

——If you need Co2 value under BTPS, the formula as follow：

$EtCO_2(BTPS)= EtCO_2*(1-(3.8/pamb))$

Of which：$EtCO_2$=from ISA delivered $EtCO_2$ value【Vol%】

pamb=from ISA delivered atmospheric pressure 【kPa】

3.8= typical partial pressure between the patient circuit and the water vapor of condensed

water of ISA 【kPa】

$EtCO_2$(BTPS)= $EtCO_2$ value【Vol%】 under BTPS

——Assumed to have been calibrated the O2 using the room air in 0.7Vol% H2O humidity level.

Module calibration

- ISA marginalia gas analyzer with automatic zero calibration function, no need the user to operate. Switch the gas sampling from the breathing circuit to ambient air will calibrate to zero automaticlly. Every 24 hours to perform an automatic zero calibrate, ISA CO2 module calibration takes less than 3s, ISA AX + monitor calibration time less than 10s.

Notice：

1) Exist air in the ISA module is very important for zero calibrating successfully, so need to ensure it's ventilated environment is good; before and after zero calibration,avoid breathing in it's vicinity.

2) ISA modules adopt stable design, and has been done a permanent calibration when leave factory, so no need for routine calibration. When appear a large measurement bias or need the annual calibration, please contact our after-sales service department for professional calibration.

Module LED status information

- LED on gas module offers a variety of instructions in order to reflect the current state in time:

Display mode	Statements
Green light no twinkle	System OK
Green light twinkle	Calibrating
Blue light no twinkle	Exist anesthetic gas
Red light no twinkle	Sensor error
Red light twinkle	Check the sampling pipe

Module cleanliness

- Allow do regularly cleaning for the monitor. To avoid dust or cleaning liquid through LEGI interface enter the monitor, during the cleaning process should always make sure Nomoline sampling tube is connected with the monitor. When cleaning the monitor, first use the damp cloth that soaked in the highest concentration of 70% of medical alcohol to wipe clean the probe, at last, with a dry lint-free cloth to dry it.

Notice：

1) Do not soak the ISA module in liquid or disinfect it;

2) Nomoline sampling tube it's not a sterile component；

3) Please do not do high-temperature high-pressure sterilization to the ISA module(including the sampling tube),otherwise it will damage the components.

Compensation

- If this Anesthesia system need to configure mainstream CO2 module（IRMA CO2）,or sidestream CO2 module（ISA CO2）,need to do N2O and O2 compensation set to ensure the accuracy of CO2 monitoring.Operation see “O2 compensation selection” and “N2O compensation selection ” instructions.

- If this Anesthesia system need to configure mainstream AG module（IRMA AX+）,or sidestream AG module（ISA AX+）,need to do O2 compensation set to ensure the accuracy of CO2 monitoring. Operation see “O2 compensation selection” instructions.

⚠**Notice：**

1) If equipped IRMA CO2 or ISA CO2 module,in the monitored gas exist nitrous oxide or O2, must do compensation settings for nitrous oxide and O2, otherwise it will cause the CO2 monitoring result is not accurate.

2) If equipped IRMA AX+ orISA AX+module,in the monitored gas exist O2,must do compensation settings for O2, otherwise it will cause the CO2 monitoring result is not accurate.

About Masimo

Masimo holds the following patent relateding products described in this manual：

SE519766；SE519779；SE523461；SE524086. Other patents pending.

Masimo holds the following licensed trademark;

MASIMO IRMA™、MASIMO ISA™、Nomoline™ 、LEGI ™.

Alarm

Summary

- If the anesthesia system itself has malfunction which cause abnormal use by the patient, or when the anesthesia system detects abnormal change in the patient's vital signs, it will send appropriate prompts to the medical staff by way of sound, light or other means, to achieve the purpose of the alert and prompt.

⚠ **Notice：**

1) The alarm device of anesthesia system comply with subclause 51.101.5 in standard of IEC 60601-2-13 and the standard of IEC 60601-1-8 2006.

2) In starting up the system, the alarm indicator has self-test procedure, i.e. a yellow and red flash turn on in succession, while it give a "beep" sound of prompt, indicating that the sound and light alarm functions are in normal condition. Otherwise, hold on the use of the anaesthetic machine, and contact the company in time.

3) When a variety of different levels of alarm is generated, the highest level of sound and light prompts shall take priority.

4) User shall set alarm sound and alarm limit according to the patient's condition, and not only depend on audio alarm system to monitor patients. The alarm sound is adjusted to a small volume, which may cause the patient to be in danger. The user should pay close attention to the actual clinical situation of the patient.

5) In the use of the anaesthetic machine, the operators should be facing the display control panel, to ensure that they are always within the distance in which they can clearly identify the alarm information.

Alarm type

- According to the nature of the alarm, the alarm in anesthesia system can be divided into physiological alarm, technical alarm and prompt information.

Physiological alarm

- Physiological alarm is usually due to some physiological parameters of patients exceeds the seted high and low limit range alarm or the patient occurs physiological abnormalities. The physiological alarm information display on the top of the screen of the physiological alarm area.

Technical alarm

- Technical alarm also known as the system error message, it is to point to some system function can not work normally or the monitoring results in distortion then trigger the alarm which caused by improper operation or system failure normal operation. Technical alarm information display on the top of the screen of the technical alarm area.

Prompt information

- Strictly speaking, prompt information does not belong to the alarm, it is to point to except the Physiological alarm and Technical alarm, the monitor will display some information related to the system state, the information is generally not involved in the patient's vital signs. Generally Prompt information display in the system technology alarm area and parameters area.

Alarm level

- According to the severity of the alarm, the physiological alarm of the anesthesia system can be divided into advanced alarm, medium alarm and low level alarm.

High Priority alarm

- The patient is in critical condition, and may have life risk, should be an immediate rescue;

Medium Priority alarm

- Physical signs of patients with abnormal, should take the corresponding measures and treatment;

Low Priority alarm

- Physical signs of patients with abnormal,maybe need to take the corresponding measures and treatment;

- All technical alarm and some physiological alarm level has been set in anesthesia system factory, the user can't change it. Some physiological alarm level can be modified.

Alarm mode

- when the alarm occurs,the anesthesia system use the following auditory or visual alarm prompt the user:

  ——Light alarm

  ——Audible alarm

  ——Alarm information

- Among them, the light alarm, audible alarm and alarm information respectively in different ways to distinguish alarm level.

Light alarm

- when the alarm occurs,alarm indicator lights use different colors and twinkle frequency suggest different levels of the alarm.

  ——High priority alarm：Red、twinkle frequency fast

  ——Medium priority alarm：Orange、twinkle frequency slow

  ——Low Priority alarm：Yellow、Normally on not twinkle

Audible alarm

- Audible alarm refers to when the alarm occurs, anesthesia system adopts different voice characteristics to indicate different levels of the alarm.

  ——High priority alarm：beep-beep-beep--beep-beep----beep-beep-beep--beep-beep

  ——Medium priority alarm：beep-beep-beep

——Low Priority alarm: beep

——Alarm Sound Pressure Level: within the range of 45dB-85dB, and the higher level of alarm is higher than the lower level of alarm in sound pressure level, namely the Low Priority ≤ Medium Priority ≤ High Priority

Alarm information

——High-level alarm： red

——Medium alarm： Orange

——Low-level alarm： yellow

- Distinguish the levels of alarm information by these symbols in front of the alarm information:

——High-levels alarm： !!!

——Medium alarm： !!

——Low-level alarm：!

Alarm Audio Pause

- Press the alarm Audio Pause Button  , The system can be set to the alarm mute state, the alarm sound of the system is blocked. the display shows 120s countdown and sound pause icon  .

Notice：

1) At the state of alarm audio pause, except the sound alarm, other alarms work normally.
2) At the state of alarm audio pause, If a new alarm is generated, the system will automatically terminate the current alarm state and restore the sound alarm.
3) When the 120s countdown is over, the system will release the current alarm and restore the sound alarm.
4) In addition to triggering the alarm and pressing the alarm mute button is invalid , the function of other alarm buttons will return to normal.

Cancellation of Alarm Audio Pause

- When the system is in an alarm sound pause, press the alarm audio pause button  or a new alarm is generated , the system will release the current alarm and restore the sound alarm, at the same time audio pause icon  turn to icon  and 120s countdown isappears.

Set the alarm volume

- Click 【Menu】 -> 【Alarm Volume】;
- Alarm Volume: 1 ~ 9. 1 is the lowest volume, 9 is the maximum. Click it, popup settings window, you can set the value by sliding your finger to the left or right, click【✓】button to confirm setting and exit window, click【✗】button to cancel setting and exit window.
- Click【Default】,Alarm volume is for factory default configuration.

Set parameters alarms

⚠**Notice**:

1) After power supply interruption of anesthesia system or restart after normal power off, alarm setting parameters can be automatically restored to saved setting before power supply interruption or before nomal power off.
2) Power supply interruption of anesthesia system is no more than 30s, Alarm setting parameters can be automatically restored to the Settings before power interruption.

Alarm limit settings for ventilator

- Click 【Menu】 ->【Alarm Setup】.
- Set one by one the alarm 【Low Limit】 and 【High Limit】 of parameters like 【Ppeak】,【VT】, 【MV】, 【Freq】, 【FiO2】, you can set the value by sliding your finger to the left or right, click 【✓】button to confirm setting and exit window, click【✗】button to cancel setting and exit window.
- Click on the top right corner 【X】 to exit.
- Click 【Default】, converted to factory default settings.

CO2 alarm limit settings

- Click 【Menu】 -> 【Alarm Setup】 -> 【Gas Module Setup】 -> 【CO2】.
- Set one by one the alarm【Low Limit】 and 【High Limit】 of parameters like 【EtCO2】、【FiCO2】、【awRR】, you can set the value by sliding your finger to the left or right, click【✓】button to confirm setting and exit window, click【✗】button to cancel setting and exit window.
- Alarm switch selection: 【on】 and 【off】. 【On】 is enabled, 【off】 for shielding.
- Adjustable alarm levels,【High】and【Mid】and 【Low】.
- Click 【Default】 converted to factory default settings.

N2O alarm limit settings

Notice:
Only system is equipped with gas analysis (anesthetic gas) module, you can set N2O and AA alarm limit.

- Click 【Menu】 -> 【Alarm Setup】 -> 【Gas Module Setup】 -> 【N2O】.
- Set one by one the alarm 【Low Limit】 and 【High Limit】 of parameters like【EtN2O】 and 【FiN2O】, you can set the value by sliding your finger to the left or right, click【✓】button to confirm setting and exit window, click【✗】button to cancel setting and exit window.
- Alarm switch selection: 【on】 and 【off】. 【On】 is enabled, 【off】 is for shielding.
- Adjustable alarm levels, 【High】and【Mid】and 【Low】.
- Click 【Default】 converted to factory default settings.

AA alarm limits settings

- Click 【Menu】 -> 【Alarm Setup】 -> 【Gas Module Setup】 -> 【AA】.
- 【HAL Alarm Setup >>】 or 【ENF Alarm Setup >>】or 【ISO Alarm Setup >>】 or 【SEV Alarm Setup >>】 or【DES Alarm Setup >>】.
- Enter 【HAL】 interface, you can click on the appropriate options such as 【ENF】, 【ISO】, 【SEV】, 【DES】 setting.
- Set the parameters 【Low Limit】 and 【High Limit】 key one by one, you can set the value by sliding your finger to the left or right, click【✓】button to confirm setting and exit window, click【✗】button to cancel setting and exit window.
- Alarm switch selection: 【on】 and 【off】. 【On】 is enabled, 【off】 is for shielding.
- Adjustable alarm levels, 【High】and【Mid】and 【Low】.
- Click 【Default】 converted to factory default settings.

Apnea alarm settings

- Touch “waveform area” (item 3 in Fig.6), click【Module Setup】->【CO2】.
- Apnea Delay: 20s、25s、30s、35s、40s、45s、50s、55s and 60s.

Set the HLM Bypass Alarm

In non-automatic circuit mode:

- Select 【Man/Spont】 key.
- Set the 【HLM】 to 【ON】 or 【OFF】. If 【HLM】 is set to 【ON】 , system prompts 【HLM】
- In mechanical ventilation mode, 【HLM】 set is invalid.

⚠**Warning:**

During 【HLM】 is set to 【ON】, part of the physiologic alarm messages may not be triggered; therefore, the setting shall be applied cautiously. The physiologic alarms include: Apnea, Apnea>2min,Paw Too High,Paw Too Low, Vt Too High,Vt Too Low,MV Too High,MV Too Low, EtCO2 Too Low, FiCO2 Too Low,FiO2 Too High,FiO2 Too Low,Freq Too High,Freq Too Low.

Alarm ON/OFF

- Click【Menu】->【Alarm Setup】->【Alarm ON/OFF】.
- Set【O2 Sensor Monitor】to 【ON】 or 【OFF】.select【ON】,the screen display FiO2 monitoring value, select【OFF】,the screen do not display FiO2 monitoring value.
- Set【Air Alarm】to 【ON】 or 【OFF】. If selecting【ON】, when air gas supply is not conneted the machine, then swich on the machine, “Low air gas supply” alarm occurs. If selecting【OFF】, the above case will not occur.
- Set【N2O Alarm】to 【ON】 or 【OFF】.If selecting【ON】, when air gas supply is not conneted the machine, then swich on the machine, “Low N2O gas supply” alarm occurs. If selecting 【OFF】, the above case will not occur.

Alarm response measures

- When the anesthesia system alarm occurs, see the following steps and take the appropriate measures:

  —— Check the alarm parameter or alarm type.

  —— Check the patient's condition.

  —— Identify the Cause of the alarm and the reasons for troubleshooting.

  ——After remove the alarm, check the alarm is eliminated or not.

- System alarm information and processing methods refer to the chapter "alarm information table" related content.

Alarm information table

- Alarm information includes physical and technical alarm information, but some alarm information is not necessarily listed.
- With a "●" indicates the level of user-adjustable.
- AA represents one of the five anesthetic gases DES (desflurane), ISO (isoflurane), ENF (enflurane), SEV (sevoflurane) and HAL(halothane).
- For each alarm message, list all the corresponding countermeasures. Follow the oprations of the countermeasures if the problem persists, contact your service personnel.

Physiological alarm

Physiological alarm information

Alarm information	Level	Reason	Reponse measures
Paw Too High	High	Ppeak Greater than Paw alarm high limit setting	Reduce tidal volume setting or increase Paw alarm high limit setting
Paw Too Low	High	Ppeak less than Paw alarm low limit setting	increase tidal volume setting or reduce Paw alarm low limit setting
MV Too High	Mid	MV Greater than alarm high limit setting	Reduce the set tidal volume,reduce the repiratory frequancy or increase the alarm high limit setting
MV Too Low	Mid	MV less than alarm low limit setting	Increase set tidal volume,increase respiratory frenqancy or reduce the alarm low limit setting
Vte Too High	Mid	Vte Greater than alarm high limit setting	Adjust the respiratory frenquancy setting,reduce the fresh gas flow,or reduce the set tidal volume or increase the alarm high limit
Vte Too Low	Mid	Vte less than alarm low limit setting	Adjust the respiratory frenquancy setting,increase the fresh gas flow,or increase the set tidal volume or reduce the alarm high limit
FiO_2 Too High	Mid	FiO_2 greater than alarm high limit setting	reduce the oxygen flow of fresh gas ,or increase the alarm high limit
FiO_2 Too Low	High	FiO2 less than alarm low limit setting	increase the oxygen flow of fresh gas ,or reduce the alarm low limit
Apnea	Mid	resp/ventilation stop(pression、volume、CO2 monitoring）	Check spontaneous breathing, the ventilator settings,fresh gas settings,each connection and piping;immediately manual ventilation.
Apnea>2min	High	Apnoea in 2 mins	Check the connections of pipes, the patient's condition, and switch to manual ventilation mode to ventilate the patient.
Apnea Ventilation	High	Apnoea in the pressure mode	Check the patient's ability to trigger. Correctly set the trigger
Pressure Limiting	Low	Ppeak greater than the set value of Plimit	Reduce the tidal volume setting or increase the Plimit setting
Continuous Pressure	High	Continuous airway pressure alarm limit is higher than over 15s	Check whether the pipe is bend, blocked or disconnected
Negative Pressure	High	Below atmospheric	Check whether the patient breathing

Paw<-10cmH2O		pressure 10 cmH_2O	spontaneously. Increase Fresh gas flow. Observe whether there is high-speed gas flow through the residual gas removal system. If so, check the negative pressure release valve on the receiver
Rate Too High	High	Rate Greater than Rate alarm high limit setting	Reduce the set value of rate or increase rate alarm high limit setting
Rate Too Low	High	Rate less than alarm low limit setting	increase the set value of rate or reduce alarm low limit setting
FiCO2 Too High	●	monitoring values greater or less than alarm high limit or alarm low limit setting	If the alarm high limit and low limit are set patient's physiological status appropriate, make adjustments as needed
EtCO2 Too High	●		
EtCO2 Too Low	●		
awRR Too High	●		
awRR Too Low	●		
FiN2O Too High	●		
FiN2O Too Low	●		
EtN2O Too High	●		
EtN2O Too Low	●		
FiAA Too High	●		
FiAA Too Low	●		
EtAA Too High	●		
EtAA Too Low	●		

Technical alarm

Technical alarm information

Alarm information	level	reason	Reponse measures
Battery Low	Mid	Battery power is less than 20%	Connected to AC power, ready to manual ventilation with 100% oxygen
The system will shut down	High	Battery power is less than 10%	Connected to AC power, ready to manual ventilation with 100% oxygen
Battery Disconnect	low	Battery is not installed	Check whether the battery is installed or after replacing the battery and installate it.
AC Disconnect	low	AC power is not connected	Check whether the AC is connected or the fuse is burning
Monitor Board Comm.Error	High	Monitoring board communication error	Check the monitoring board and the control board communications and the power supply is normal
Self-inspection Error	High	Self-inspection Error	Enter the alarm log to check the alarm message, switch manual ventilation.
Power Failure	High	Power failure	Check the board output voltage is normal, please use the manual ventilation

Expiration Valve Failure	Mid	Exhalation valve failure	Check exhalation valve voltage is normal, please use the manual ventilation
Inspiratory Valve Failure	Mid	Inhalation valve failure	Check inhalation valve voltage is normal, please use the manual ventilation
ProportionValve Failure	Mid	Proportion Valve Failure	Check the proportion valve voltage is normal, please use the manual ventilation
Flow Sensor Failure	low	Flow sensor monitoring failure	Check if the flow sensor is deformed, water and so on. Please re-calibration
Calibrate flow Sensor	low	Flow sensor calibration failure	Check whether the front air supply pressure is between 0.4 ~ 0.5MPa and the communication cable for the calibration of the instrument is good
Calibrate pressure Sensor	low	Pressure sensor calibration failure	Check whether the front air supply pressure is between 0.4 ~ 0.5MPa and the communication cable for the calibration of the instrument is good
Safe valve control failure	Mid	Proportional valve control failure	Check whether the operating voltage of proportional valve is normal
Pressure Sensor Failure	Mid	Pressure sensor failure	Patients end pressure monitoring malfunction, use manual ventilation
Calibrate O2 Sensor	low	Oxygen sensor failure	Check the oxygen sensor is expired or failure, replace the oxygen sensor
Low Drive Gas Press	High	Driving gas supply pressure is low	Please use the spare gas cylinders, or using manual ventilation.
No O2 Pressure	High	Insufficient oxygen supply pressure	Using a new oxygen cylinder or open the cylinder valve. Use Central oxygen supply
Zero Valve Failure	low	Valve zero failure	Reboot the machine after a power interruption. Please use the manual ventilation
Check Flow Sensor	High	Abnormal flow sensor readings	calibrate the flow sensor after the reinstallation
Pinsp Not Achieved	low	Unrealized inspiratory pressure	Check the breathing circuit connections and settings
Vt Not Achieved	low	Unrealized tidal volume	Check the breathing circuit connections and settings.
Patient Circuit Leak	Mid	Breathing circuit leak	Check the breathing circuit leaks, see
Absorber Panel Open	High	Soda lime canister is not installed in place	Reinstall soda lime canister
O2 Sensor not connect	low	Oxygen battery cables are not installed in place.	Please check if the oxygen battery cables are installed in place
Replace O2 Sensor	Mid	Oxygen sensor expired or failure	Replace the oxygen sensor
Flowmeter Comm.Error	High	Flowmeter communication error	Check if the flow meter panel's output data communications voltage is normal
O2 Electronic Sensor Fail	low	Oxygen flowmeter sensor fails	Check if the oxygen flowmeter sensor communication is normal
N2O Electronic Sensor	low	Nitrous oxide	Check the laughing gas flowmeter sensor

Fail		flow meter sensor fails	communication is normal
Air Electronic Sensor Fail	low	The air flow meter sensor fails	Check the air flowmeter sensor communication is normal
AG Comm.Stop	High	AG communication stop	Check the AG module failure or communication failure
AG Comm.Error	High	AG communication error	Check the AG module cable is connected correctly or communication failure
AG Sensor Off	High	AG sensor Stop monitoring	Put the AG module into standby mode, stop the measurement. Please disconnect AG module, stop using the contact maintenance personnel.
Sensor Err(AG)	Mid	AG sensor error	
Software Error(AG)	Mid	AG software error	
Hardware Error(AG)	Mid	AG hardware error	
Motor out of accuracy(AG)	Mid	AG monitoring accuracy error	
Factory Calibration lost(AG)	Mid	AG initialization error	
Temp out of accuracy(AG)	Mid	Ambient temperature	Check the gas line connection status, make sure the environment in line with the specifications of the anesthesia system, if there are special reasons influence environmental pressures. Try to re-boot.
Pressure out of accuracy(AG)	Mid	Atmospheric pressure is too low or too high	
Mixed Agents	low	Mixed agents	Replace anesthetic and wait end of conversion
Check Adapter	Mid	Adapter abnormal	Check whether the adapter probe is dirty, replace the adapter
Check Sampling Line	Mid	Sampling tube abnormalities	Check if the sampling tube is blocked, water, replace the sampling tube
Replace Adpter	Mid	Adapter abnormal	Check module LED red light does not blink, replace the adapter
Sampling line clogged	Mid	Sampling line clogged	replace the sampling tube
No Sampling line	Mid	Do not detect the sampling tube	Check if the sampling tube was installed in place, or replace the sampling tube
No Adpter	Mid	Do not detect the adapter	Check if the adapter is installed in place, or replace the adapter
CO_2 out of accuracy	Mid	CO_2 accuracy error	Check if the AG / CO2 monitoring module is abnormal, replace AG / CO2 module
N_2O out of accuracy	Mid	N_2O accuracy error	Check if the AG monitoring module is abnormal, replace AG module
AA/AA2 out of accuracy	Mid	AA/AA2 accuracy error	Check if the AG monitoring module is abnormal, replace AG module
O_2 out of accuracy	Mid	O_2 accuracy error	Check if the O2 sensor is expired or failure, replace the O2 sensor

Cleaning and disinfection

⚠Warning:

1) Please comply with applicable security regulations.

2) The company provides the clean machine and accessories in the factory, but without disinfection and sterilization. If it offers the products and their components with disinfection and sterilization, in the prominent position on its packaging will indicate "sterile" and other information.

3) Before first time to use it, follow the recommended method in this chapter, take the necessary cleaning, disinfection and sterilization for the machine and accessories. Prohibition of the cleaning, disinfection and sterilization to the disposable use accessories.

4) Reusable Accessories of anesthesia system or anesthesia ventilation system, it should be cleaned and disinfected before re-use as necessary in accordance with the method recommended in this chapter, without disinfection will result in the risk of cross infection.

5) Carefully read all operating and maintenance instructions of the disinfection equipment.

6) Read the material safety data description of each detergent.

7) Wear protective gloves and safety glasses.

8) The components can only be removed and installed by the instructions of this chapter , if the components are removed and installed improperly, it will lead to the leak risk of the anesthesia ventilation systems.

9) The components can only be leaned and disinfected by the instructions of this chapter , if the components areleaned and disinfected improperly, it will lead to the damage risk of the anesthesia ventilation systems.

10) Do not use calcium carbonate, calcium stearate, maize starch, talc or similar material to prevent adhesions. These materials may enter the patient's airway or lungs, causing irritation or damage.

11) Checking if the parts are damage during operation, the damaged parts should be replaced.

12) After the cleaning and the disinfection are completed and re-installed, be sure to pass the test examination of the instructions of "preoperative test" , the anesthesia system will be allowed to use ; otherwise, you should discontinue use it and contact our after-service personnel.

13) Do not inhala the smoke dust during operation;If the oxygen sensor is damaged, it could lead to leak and cause burns.

14) After cleaning or disinfecting The machine,the accessories, ensure the related components are completely dry, after that, install and connect the AC power.

⚠ **Notice:**

1) High temperature steam sterilize only the components which are marked with parts 134 ℃.

2) To prevent the abrasion of device, do not use abrasive cleaning agents (such as the silver polish or cleaning agents, the steel wool).

3) Do not use halogenated organic or petroleum-based solvents, acetone, glass cleaner or other harsh cleaning agents.

4) If there is any doubt about the cleaning agent, please check the reference data and instructions which are provided by the manufacturer.

5) Cleaning solution pH must be within the range of 7.0 to 10.5.

6) Do not soak the synthetic rubber parts over than 15min, otherwise it will lead to accelerated aging or swelling.

7) Do not allow the liquid to flow into the anesthesia system housing case.

8) Ensure that all liquids away from the electronic components.

Cleaning methods

- There are two manual cleaning methods: general cleaning and rinsing soak.

  ——General cleaning is that using the damp cloth which are soaked in the flexible detergent solution (as 70% of medical alcohol) to wipe the shell surface, then wipe it dry with a dry cloth.

  ——refers to the rinsing soak, rinsing with water, then add warm water with weakly alkaline detergent solution soak for 3 ~ 5min, then use the water to rinse, and finally wipe it clean with the solution of 70% medical alcohol .

Disinfection methods

- The autoclavable Disinfection is achieved by the stream with 134 ℃ at most. Before disinfecting the components, they should be cleaned, and then at 121 ℃ temperature and under the 1.05kg / cm2 steam pressure, sterilizing during 15 ~ 20min. All the components have 134 ℃'s high temperature sterilization mark which are applicable with this disinfection methods.

- Take the combined action of hydrogen peroxide and ozone disinfection manner. The disinfection is according to the disinfection procedures (atomization 15min, disinfection 60min, 10min drying procedures).

Cleaning and disinfecting for the machine enclosure

- Make sure the AC input plug has been pulled out, and the device is turned off;

- In accordance with the first methods of this chapter "Cleaning Methods", cleaning the whole enclosure.

⚠**Warning:**

Ensure that no liquids penetrate inside the control module in the cleaning process, in order to avoid causing personal injury or damage of internal components.

Note:

1) The disinfection method by spreading or spraying the disinfectant to the housing case, due to the short reaction time, it can only reduce the number of bacteria in the surface of the machine, so do not adopt it!

2) Display screen can not touch the liquid, it can only be cleaned by the dry lint-free soft cloth.

Disassemble and install the components of the anesthesia ventilation system which could be cleaned and disinfected

- If you want to make the cleaning and the disinfection to the system of anesthesia ventilation, you should firstly disassemble allthe components of respiratory system which could be rinsed and disinfected

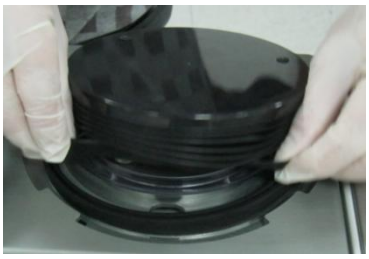
Disassemble the bellows components

- Disassembly:

—— Holding the shell of the bellows cover with two hands, counterclockwise unscrewing；

—— Lifting the bellows cover;

——Remove the folding bag from the base seat of the bellows.



- Cleaning and disinfection:

——According to the second article of chapter "cleaning methods", and also the first article and second article of "Disinfection Methods", clean the bellows components by the method of completely rinsing soak cleaning and disinfect by autoclaving or disinfect the components by the method of hydrogen peroxide and ozone combined action.

- Installation:

——According to the reversed operational process, install the bellows components.

> ⚠**Note:**
>
> 1) If you need disinfect the bellows components by autoclav, firstly you should assemble thebellows components well before effecting the autoclavable disinfection. On being disinfected by autoclav, make the bellows components towards up.
>
> 2) On cleaning, please disassemble the bellows assembly apart to clean, otherwise it will take a long time to dry them.
>
> 3) After drying folding bag, it should be suspended and fully developed. Otherwise, it may make the folding bag adhesive.

Disassembling the breathing air check valve components

- Disassembly

——Holding the cover of the check valve, unscrew it counterclockwise, take the cover of the check valve out.

——Pull out the inspiratory check valve from the circuit

- Cleaning and disinfection

——According to the second article of chapter "cleaning methods" , and also the first article and second article of "Disinfection Methods", Clean the components of the expiratory and inspiratory check valve by the method of completely rinsing soak cleaning and disinfect them by autoclaving or disinfect the components by the method of hydrogen peroxide and ozone combined action .

- Installation

——According to the reversed operational process, install the expiratory and inspiratory air check valve components.

Disassembling the inspiratory hose and connectors of type Y

- Disassembly

——Take down the inspiratory hose and expiratory hose from the inspiratory port and expiratory port.

——Take down the filter from the patient connecting port of the Y-shaped tube.

- Cleaning and disinfection

——According to the second article of chapter "cleaning methods" , and also the first article and second article of "Disinfection Methods", Clean the silica gel hoses and the Silica gel masks by the method of completely rinsing soak cleaning and disinfect them by autoclaving or disinfect the components by the method of hydrogen peroxide and ozone combined action .

Note:

1) Do not reuse disposable filters, expiratory and inspiratory hoses and masks, thet should be disposed of in accordance with local medical waste disposal regulations.

2) To prevent damage to the expiratory and inspiratory tubes, please hold on joints of both ends of the expiratory and inspiratory tube for disassembling.

- Installation

——According to the reversed operational process, install the expiratory and inspiratory tube and the Y-type connector.

Disassembling the manual breathing bag

- Disassembly

——Hold the port parts of the bag, push down with the appropriate force, take down the bag from the connection port.

- Cleaning and disinfection:

——According to the second article of chapter "cleaning methods" , and also the first article and second article of "Disinfection Methods", Clean the silica gel bladder by the method of completely rinsing soak cleaning and disinfect it by autoclaving or disinfect the bladder by the method of hydrogen peroxide and ozone combined action .

Note：

1) Do not reuse the disposable bladder,it should be disposed of in accordance with local medical waste disposal regulations.

- Installation

——According to the reversed operational process, install the manual expiratory and inspiratory bladder.

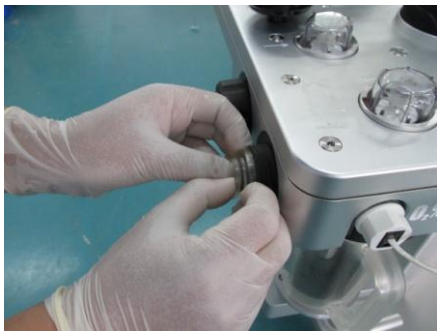
Disassembling the flow sensor

- Disassembly

——Unscrew counterclockwise the lock nut which is on the inspiratory port.

——Pull out both the lock nut and the inspiratory port.

——Pull out the inspiratory flow sensor.



- Cleaning and disinfection:

——According to the second article of chapter "cleaning methods", Clean the inspiratory flow sensor and the expiratory flow sensor by the method of rinsing soak cleaning. That is, first rinse with water, then added weakly alkaline detergent solution of warm water and soak for 3 ~ 5min, then use the water to rinsin, and finally wipe clean the surface of the inspiratory flow sensor with 70% of medical alcohol.

warning:

1) Do not disinfect the flow sensors by the autoclave;

2) Do not clean the flow sensors with a brush or by the high pressure gas ;

3) Do not use unapproved cleaning agents containing polycarbonate.

4) Do not clean the inner surface of the flow sensor, you can only wipe the outer surface with a damp cloth.

- Installation

—— According to the reverse operation Process, install the expiratory flow sensor and the inspiratory flow sensor separatetly.

Airway Pressure Gauge

- Disassembly

——Hold the airway pressure gauge and press buckle spring, remove the airway pressure gauge from the circuit.

- Cleaning and disinfection

——According to the frist article of chapter "cleaning methods", wipe clean the outer surface of the airway pressure gauge.

warning:

Do not rinse soak the airway pressure gauge, or disinfect it by autoclave;

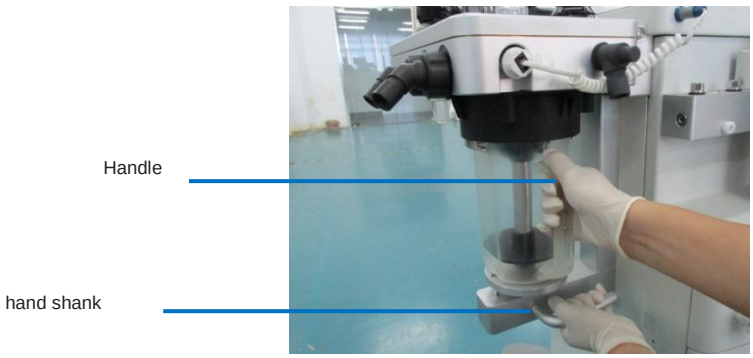
- Installation

——Press the buckle spring does not move, Loosen it after installed the upper airway pressure gauge, and install the airway pressure gauge with a appropriate force.

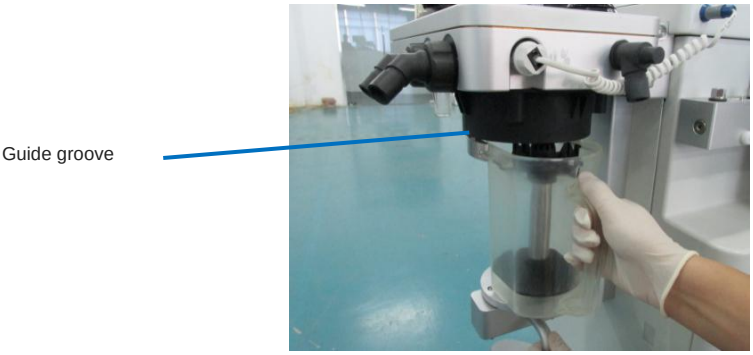
Disassembling the soda lime canister

- Disassembly

——Grab handle canisters, slightly with the point force will press the handle down to unlock the canister;



——Guide groove disengage and remove the canister.



- Cleaning and disinfection

——According to the second article of chapter "cleaning methods" , and also the first article or second article of "Disinfection Methods", Clean the absorption canister by the method of rinsing soak cleaning, disinfect it by autoclave or by the method of hydrogen peroxide and ozone combined action.

> ⚠ **warning:**
>
> Soda lime has a strong corrosive, such as a strong irritant to the eyes, respiratory system and skin. If you accidentally stick to soda lime, wash immediately with water, if there is still discomfort after washing, please seek for medical help immediately.

- Installation

——Please see the chapter the process of the installation of soda lime canister.

Disassembling the water cup

- Disassembly

  ——Rotate counterclockwise and remove the water cup.

- Cleaning and disinfection

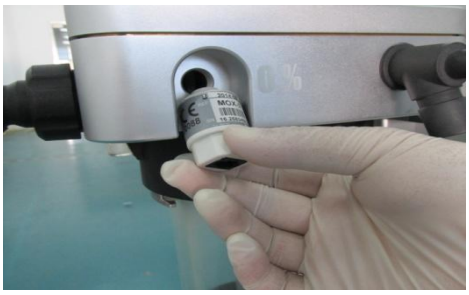
  ——According to the first article of chapter "cleaning methods" , and the second article of "Disinfection Methods", Clean the water cup by the method of hydrogen peroxide and zone combined action.

Disassembling the oxygen sensor

- Disassembly

  ——Pull out the electric cable plug of the oxygen sensor

  ——Counterclockwise unscrew the oxygen sensor, remove the oxygen sensor.



- Cleaning and disinfection

  ——According to the first article of chapter "cleaning methods" , Clean the the oxygen sensor by the method of the general cleaning, General cleaning is that using the damp cloth which are soaked in the flexible detergent solution to wipe clean the oxygen sensor , then wipe it dry with a dry cloth.

⚠Warning:

1) Do not put the oxygen sensor soaked in the liquid alone or with anesthesia ventilation system;

2) Do not disinfect the oxygen sensors by autoclave;

3) The condensation water vapor that on the oxygen sensor surface would cause inaccurate measurement of the oxygen concentration, the moisture on the surface should be promptly removed.

- Installation

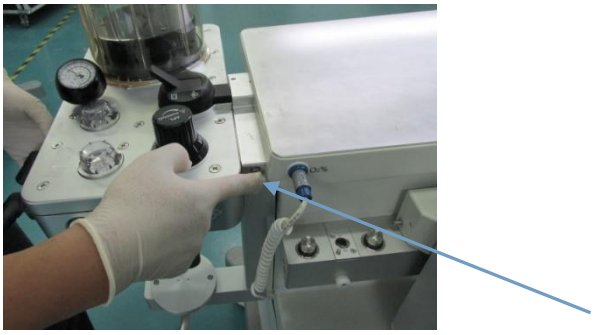
——According to the reverse operation process, install the oxygen sensor.

Disassembling the breathing circuit

- Disassembly

> ⚠**Warning:**
>
> When removing the circuit, first make sure the demolition absorb CO2 canister is removed, then the following steps disassembly operations. Otherwise lead to the demolition fail.

——Ensure that the composents has been disassembled, hold the circuit by one hand and press the lock key on the circuit.



——Take down the circuit on the base seat of the circuit.

- Cleaning and disinfection:

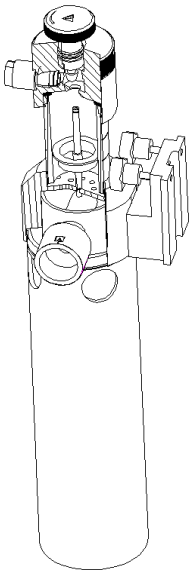
——According to the firt article of chapter "cleaning methods", and second article of "Disinfection Methods", disinfect it by the method of hydrogen peroxide and ozone combined action.

> ⚠**Note:**
>
> 1) Do not put the whole circuit case soaking in liquid or disinfect it by autoclave.
>
> **2)** Be careful, make sure that the circuit electrical connections must be correct.

AGSS delivery and collection system

- Disassembly

——Counterclockwise unscrew the nut which is for fixing the AGSS,remove the waste gas treatment system which is connected with the cover of the AGSS;



——Counterclockwise unscrew the cover till it is released from the observation window.

——Remove the filter which is installed on the inside of the cover;

——Remove the observation window；

——Remove the float；

- Cleaning and disinfection

——Blow away the dust which is attached to the filter of the AGSS components with the compressed air.

——In accordance with the instruction of this chapter "cleaning method", clean the float of the AGSS components by the method of the general cleaning. That is, wipe clean the choke plate and the float with a damp cloth which are soaked in the flexible detergent solution, then wipe it dry with a dry cloth.

- Installation

——After completed drying the AGSS components, reference to the above disassembly step, according to the opposite operation of the process, finish the installation of the AGSS system components.

Cleaning gas monitoring module

- Cleaning methods for gas monitoring modules see the relevant description in the Chapter "Gas monitoring module".

Maintenance

Maintenance intervals

Warning：

1) Before maintenance the system should be cut off the power and the gas supply refers to the manual of the system. The system shall be dried after cleaning and do not cover the system with wet plastic bag. Prevent any water leaking into the machine.

2) Do not use lubricants that contain oil or grease. They can burn or explode in the presence of high O2 concentrations.

3) Only use lubricants approved for anesthesia or O2 equipment.

4) Use care when moving or replacing system parts and components. Movable parts and removable components may present a pinch or a crush hazard.

5) Refer to the disinfection control and safety regulation; the used system may be contaminated by blood or body fluid.

Note：

Before maintenance, the machine and all parts shall be cleaned and disinfected especially before returning for repair.

Maintenance principle

- Prior to operate or clean the system, check the modules and parts accordingly including the Y tube, filter, mask, breathing circuit parts and seal ring. Repair or replace the damaged parts.
- Maintenance should be performed by a trained technician. The maintenance schedule should be every 1000 hours usage or six months, or the system is being powered off for six months. The maintenance record should be kept by specially-assigned person.
- A service agreement between the user and the company is recommended to authorize the company proceed the regular check and maintenance.

Maintenance schedule

- The following maintenance schedule is based on the 2000 hours annual usage. More maintenance worl should be conducted if the usage time is more than that.

Minimum frequency	Maintenance content
daily	Clean the external surfaces.
	Perform 21% O2 calibration (O2 sensor in breathing system).
	Check the anesthetic gas module or CO2 module before operation.
	Make sure the airway pressure meter hand is at zero under the atmosphetic pressure.
Every tow weeks	Evacuate the remained anesthetic gas in the vaporiszer
Every month	100% O_2 calibration (O_2 sensor in breathing system).
As necessary	Replace the defective sodalime in the canister
	Replace the O2 sensor if it can not be calibrated(the working life should be at least one year)
	Replace the damaged flow sensor
	Replace the damaged APL valve
	Replace the damaged gasket on the gas cylinder connector
	Replace the disabled fuse
	Main stream anesthetic gas or CO2 module zeroing
	Flow sensor, pressure sensor and three way valve zeroing
	Empty the water trap
	Clean the AGSS strainer
	Clean the hardware case air inlet filter net
Annually	Replace the o type ring at the connector of the vaporizer
	Replace the filter of the gas supply inlet
Every three years	Replace the built-in Li battery

Breathing system maintenance

- When cleaning the breathing system, replace any parts that are visibly cracked, chipped, distorted orworn. For details, refer to Chapter “Installation” and Chapter “clean and disinfection”.

Replace the fuse

To replace the fuse:

- Pull out the AC power plug;
- Open the fuse box with the screwdriver;
- Install the fuse, the fuse shall be the same as the original one;
- Installation procedure is adverse to the above steps.

O2 calibration

⚠ **warning：**

1) Do not perform calibration while the unit is connected to a patient
2) To calibrate the O2 sensor, the environment pressure should be the same as the oxygen deliver pressure in the circuit. Otherwise the monitoring value may be inaacurate.
3) Follow the biohazard regulation when dispose the O2 sensor. To discard the sensor should follow the local medical waste disposable regulations.

21%O2 calibration

⚠ **Note：**

1) The O2 needs 21% calibration when the Oxygen concentration value is of big error or replace the sensor.
2) No need to calibrate the O2 sensor when do not operate the O2 sensor.
3) To calibrate the O2 concentration, the system should be at stdandby.

Calibration procedure：

- Make sure the system status is standby, press the button  【StandBy】,select 【OK】 in the prompt window to make the system enter standby status.
- Remove the O2 sensor from the O2 sensor port on the breathing system. Allow 2-3 minutes for the sensor to acclimate to the environment
- Select the【Menu】->【O2 Calibration】->【21% O2 Calibration】, the press the 【Start】button, the system will start the “21% O2 calibration” and display the progress bar.

- During calibration, press the【Stop】button, the system will stop the calibration. The calibration is failed.
- If the calibration is passed, the system will display the time and O2 sensor model and the information of ：【PASS】, otherwise will show ：【Failure】 and require a recalibration.
- Press 【Exit】button to exit the calibration.

> ⚠ **Note：**
>
> 1) In case of calinration failure, please check related technical alarms. Repeat the calibration then.
> 2) Incase of repeated calibration failures, replace the O2 sensor and repeat the calibration. If calibration still fails, contact our company technical support.

100%O2 calibration

> ⚠ **Note：**
>
> Before 100%O2 calibration, make sure 21%O2calibration finished.

Calibration procedure：

- Install the O2 sensor back into the circuit, refer to “the O2 sensor installation”.
- Make sure the system status is standby, press the button  【StandBy】,select 【OK】 in the prompt window to make the system enter standby status.
- Install the O2 sensor into the circuit and pull out the breathing tube at inspiratory port .
- The ACGO is in the closed state, open the standby oxygen flowmeter.
- O2 inlet connect with the pure oxygen supply, other gas supply inlet closed or no connection. The fresh gas flow is set to 8L/min for about 5 minutes.
- Select【Menu】->【O2 Calibration】->【100% O2 Calibration】 then press the 【Start】button, the system will start the “100% O2 concentration calibration” and display the progress bar.
- During calibration, press the【Stop】 button, the system will stop the calibration. The calibration is failed.
- If the calibration is passed, the system will display the time and O2 sensor model and the information of ：【PASS】, otherwise will show ：【Failure】 and require a recalibration.
- Press 【Exit】button to exit the calibration.

> ⚠ **Note：**
>
> 1) In case of calinration failure, please check related technical alarms. Repeat the calibration then.
> **2)** Incase of repeated calibration failures, replace the O2 sensor and repeat the calibration 21% O2 calibration then for 100% O2 calibration. If 100% O2 calibration still fails, contact our company technical support.

Airway pressure meter zeroing

If the airway pressure meter does not return to zero, the pressure indicator will be not correct. Bystop the manual or mechanical ventilation to make the airway pressure close to zero, and then observe the indicator postion at zero or not. To zero the airway pressure meter if the indicator does not return to zero. The procesure is as follows:

- Stop the manual or mechanical ventilation, and make sure the ventilation pipe is connected to the anethesia breathing system. The patient connector of the respiratory pipeline is open to the atmosphere and the folding bag is fully falled in the below.
- Use a small screw driver or the finger to open the lens cover of the airway pressure meter and remove the lens.
- Use the small slotted screw driver to adjust the zeroing screw until the pressure meter indicator needel to zero postion.
- To turn the “manual/mechanical switch” to mechanical ventilation, and start the mechanical ventilation.
- Seal the patient connector of the Y-tube to close the breathing circuit.
- Press the “O2 flush” button repeatedly to make the pressure meter indicator needle swing back and forth.
- Reopen the patient connector of the Y-tube and loose the “o2 flush” button, then check the indicator return to zero or not. If the pressure indicator has returned to zero, assemble the pressure meter lens.
- Please contact our company after-sales service department if the pressure indicator still unable to return to zero.

⚠**Note：**

When clean or disinfect the parts, the part shall be replaced if it is cracked, broken, deformed orabrased.

Maintenance of AGSS transmission system tube

- Check the tube, please change it if it's damaged.

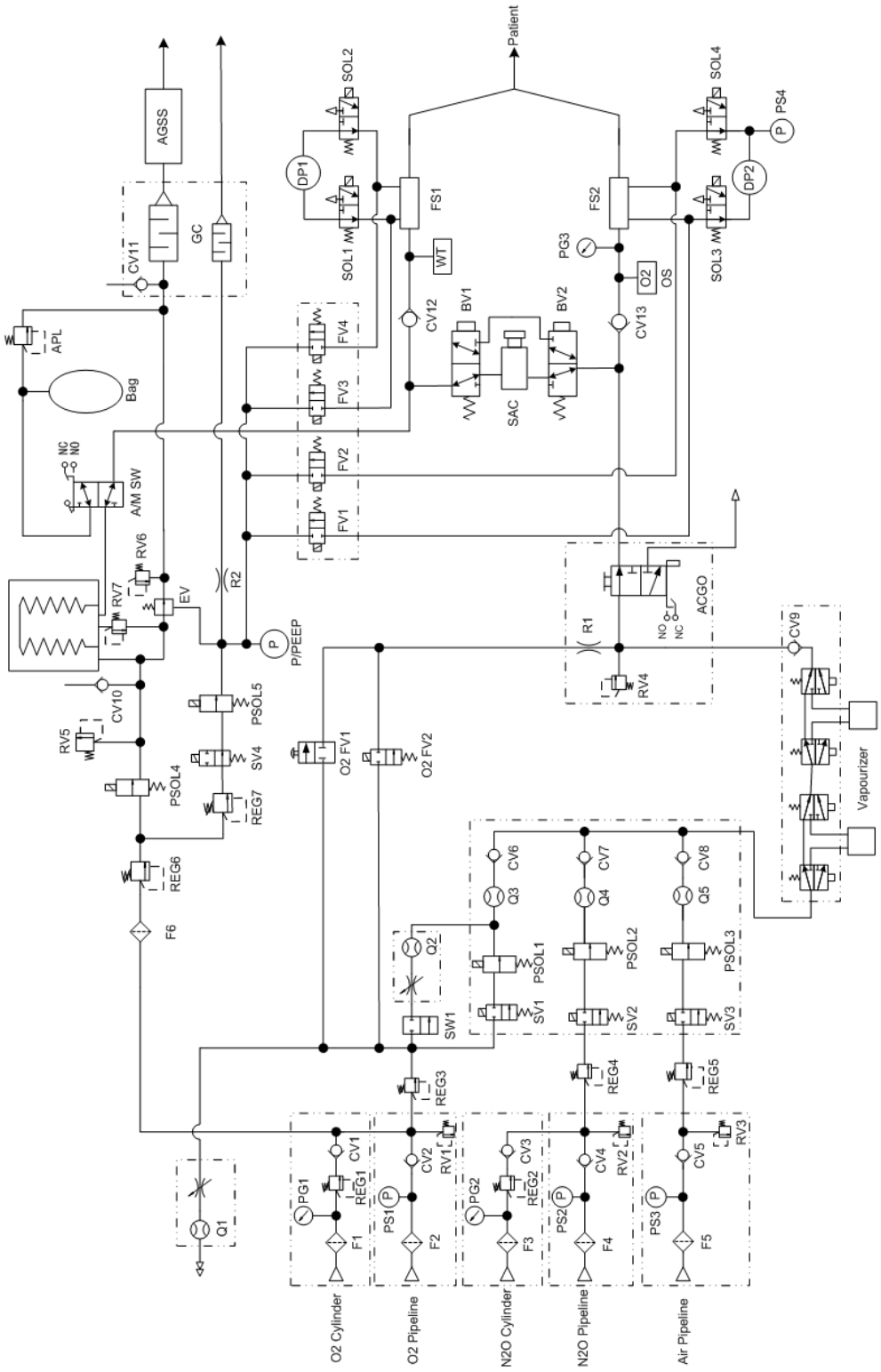
Method for clearing stagnant water

- Connect the inspiratory port and expiratory port with a tube.
- Press the "  " key, the mathine start work.
- Enter the system and choose【Start Ventilation】.
- Turn the "manual/mechanical switch" to "  " mechanical ventilation.
- Ensure Sufficient gas supply.
- Open O2 supply, adjust flow to no less than 10L/min.
- Keep ventilation state, the machine works for 1~2 hours until the water is removed from the respiratory system.

System Principle

Airway system

Airway schematic diagram



Tab.1 Components Description

F1	Filter/O2 centre Gas Supply	F2	Filter/reserve O2 centre Pipeline Gas Supply
F3	Filter/N2O centre Pipeline Gas Supply	F4	Filter/air centre Pipeline gas supply
F5	Filter/ driven gas	RV1	Pressure Relief Valve750kPa）/ high pressure oxygen
RV2	Pressure Relief Valve(750kPa)/ High pressure reserve oxygen	RV3	Pressure Relief Valve(750kPa)/ High pressure N2O
RV4	Pressure Relief Valve750kPa）/ high pressure oxygen	RV5	Pressure Relief Valve（37.9KPa）/ACGO
RV6	Pressure Relief Valve(110cmH2O)	RV7	POP-OFF Pressure Relief Valve
RV8	Pressure Relief Valve (10cmH2O)	CV1	Check Valve/O2 centre Pipeline Gas Supply
CV2	Check Valve/ reserve O2 centre Pipeline Gas Supply	CV3	Check Valve/N2O centre Pipeline Gas Supply
CV4	Check Valve/air centre Pipeline gas supply	CV5	Check Valve/O2
CV6	Check Valve/ N2O	CV7	Check Valve/Air
CV8	Check Valve/ before Mixed gas evaporator	CV9	Free breathing Check Valve
CV10	Check Valve/ patient inspiratory port	CV11	Check Valve/ patient expiratory port
Q1	Auxiliary O2 Gas Flow Meter	Q2	Auxiliary Air Gas Flow Meter
Q3	Flow meter/ Emergency fresh gas	Q4	Flow Sensor/O2
Q5	Flow Sensor/N2O	Q6	Flow Sensor/Air
REG1	Pressure Regulator/O2 Supply	REG2	Pressure Regulator/ N2O Supply
REG3	Pressure Regulator/Air Supply	REG4	Pressure Regulator/Driven Gas Supply
REG5	Pressure Regulator/Driven Gas Supply	PG1	Pressure Gauge/O2 supply
PG2	Pressure Gauge/N2O supply	PG3	Pressure Gauge/ Air supply
PG4	Pressure Gauge/ inspiratory port	PS1	Pressure Sensor/O2 supply
PS2	Pressure Sensor/ N2O supply	PS3	Pressure Sensor/ Air supply
PS4	Pressure Sensor/ expiration	PS5	Pressure Sensor/ Driven Gas
SW1	Switch of Emergency Gas	SV1	Safety valve/O2
SV2	Safety valve/N2O	SV3	Safety valve/Air
SV4	PEEP Safety valve	PSOL1	Proportional Valve/O2
PSOL2	Proportional Valve/ N2O	PSOL3	Proportional Valve/ Air
PSOL4	Proportional Valve/ Driven Gas	PSOL5	Proportional Valve/PEEP rack
BV1	BpassValve	BV2	BpassValve
DP1	Differential Pressure Sensor	DP2	Differential Pressure Sensor
FS1	Expiration flow sensor	FS2	Inspiration flow sensor
R1	Gas resistence	R2	Gas resistence
O2FV1	Oxgen flush（mechanical）	O2FV2	Oxgen flush（electronic）
SV2	Safety valve/N2O	SAC	Sodium lime absorption tank
EV	Exhalation valve	ACGO	ACGO selection switch
A/W SW	mechanical/manual switch	APL	Adjustable pressure limit valve
Bag	Manual airbag	SAC	Sodium lime absorption tank
WT	Water cup	OS	O2 sensor
AGSS	Anaesthetic gas scavenging disposal systems		

Principle description

- This device is a pneumatic electric controlled anesthesia system. The gas supply includes the pipe gas supply and the spare sylinders. The pipe gas supply includes the O2, N2O and the AIR with the working pressure2000 ~ 15000 KPa. Each connector is equipped with filter, check valve, pressure relief valve, pressure regulating valve and pressure monitoring device, by adjusting the pressure regulating valve on 200 ~ 300 kPa to keep the stable gas supply. Pressure relief valve is used to prevent the over high pressure of the input gas. The check valve is used to prevent the counter current and the filter to prevent the impurities into the pipe. Each connector has a clear label and with the fool-proof design to avoid the operator connecting to the wrong gas supply.

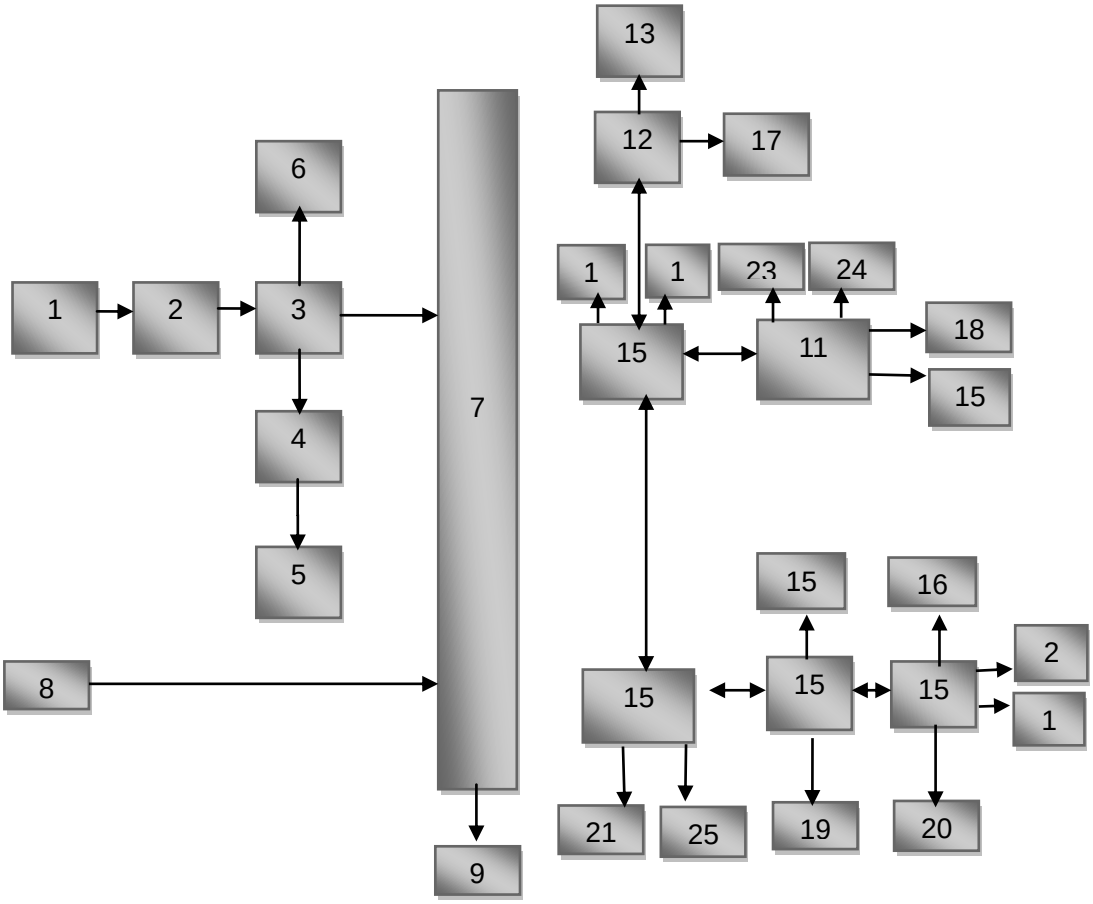
- When starts the system, the gas goes through the gas suuply connector, the pressure regulatingvalve and the pressure go down to 200 kPa which enable the stable gas output. The gas goes through the electric switch valve, electric proportion valve and fow sensor, and the system monitors the gas pressure by the pressure sensor on the signal collection board. For example, when the pressure of O2 is lower than 220 kPa, the ventilator will send the alarm of low gas supply pressure. If the O2 pressure is lower than 100 kPa, the system will automaticly cut off the N2O supply, but will not affect the air supply. At the same time, the system also controls the concendation of O2 not less than 25%. O2, AIR and N2O are mixed in the flow meter, then go through the vaporizer and carry some anesthetic agent. This forms the fresh air which flows to the ACGO switch from the check valve. When the ACGO switch is open, the system stops the mechanical ventilation and the fresh air flow out from the ACGO outlet. The mechanical pressure relief valve protects the over high pressure under ACGO. When the ACGO switch is closed, the fresh is sent back to the breathing circuit supplying to the patient during the mechanical ventilation. The rapid O2 button function is that the O2 output does not through the flow meter and vaporizer, which is directly sent to the breathing circuit. When the electric flow meter does not work properly or without power supply, to start the oxygen mechanical flow meter to supply the fresh gas and put the oxgen meter to open postion.

- The anesthesia ventilator includes the bellows and control parts. The control parts include the powerinput, gas supply input, control display, electric switch, pressure sensor, flow sensor, electric proportion valve and the PEEP valve. The bellows parts include the bellow, cover, base (including the connector) and POP-OFF valve. When inspiration, the electric proportion valve set the respiration flow speed, drives the gas into the breathing circuit bellow. The bag in the bellow will move down because of the pressure, to force the gas go into the patient lung through the soda lme canister. When respiration, the electric proportion valve will be closed. The fresh gas and the gas breathed out from the patient are mixed in the bag which makes the bag go up in the bellow. Then the gas outside the bag will be exhausted by the ventilator until the respiration finished.

- During the ventilation, the anesthesia system monitors the patient airway pressure and tidal volume. The visible and audible alarm will be generated if the airway pressure and the tidal volume are not in the limit of the alarm. If the airway pressure is over is over the limit, the ventilator will enter inspiration automatically to avoid the over high pressure for the patient. There is one inside pressure safety valve of 110cmH2O, when the pressure is over 110 cmH2O （11 kPa）, the valve opens to prevent the airway pressure continuous rising.

Electric System

Electric system structure



Structural components list

1	Power cord	17	Fan
2	Power interface	18	Calibration interface board
3	Fuse 1	19	Three-way valve
4	Fuse 2	20	Contact switch control
5	Auxiliary output port (4 ports)	21	Oxygen sensor
6	SMPS board	22	Heating module
7	DC/DC board	23	USB interface
8	Battery	24	Nurse call interface
9	Heating module	25	Speaker
10	Monitor board	26	Electronic flow meter board
11	High voltage acquisition board	27	Touch screen
12	Low voltage acquisition board	28	Display screen
13	The screen adapter board	29	Electronic flowmeter board
14	Main board	30	Electronic flow sensor control valve
15	Ventilator control board	31	Electronic flow sensor power
16	LED board		

Product Specifications

Ntice：
All display measurement values involved in operation manual are measured at 20 ℃ + 3 ℃, relative humidity not more than 80% and atmospheric pressure conditions, except measuring range and accuracy of anesthetic gas and carbon dioxide monitoring module, it applies to a dry gas at 22℃ ±5℃,1013±40hPa.

Environment Requirements

	Work enviroment	Storage and transportation
Temperature	5℃～40℃	-25℃～+60℃
Relative humidity	No more than 80 %, non-condensing	10%～93%,non-condensing
Atmosphere pressure	70kPa～106kPa	50kPa～106kPa
Noet：oxygen sensor and vaporizer spefifications pleaser refers to the “Oxygen sensor” chapter		

Power Supply

Electric power	
Total AC Input	100-240V～, 50/60 Hz,6Aa)
Fuse	T10AH 250V
Auxiliary mains socket-outlet 1	100-240V～, 50/60 Hz,1.3A
Auxiliary mains socket-outlet 2	100-240V～, 50/60 Hz,1.3A
Auxiliary mains socket-outlet 3	100-240V～, 50/60 Hz,1.3A
Auxiliary mains socket-outlet 4	100-240V～, 50/60 Hz,1.3A
Auxiliary mains socket Fuse	T2AH 250V
Power cord	
Length	5m
Type	Three-wire power cord
Note a: The input power of the anaesthetic system includes the maximum rated power output of the anaesthetic ventilator and all the auxiliary mains socket-outlet.	
Battery information	
Type	Internal Li-battery 11.1 VDC 4000 mAh
Quantity	2
Working time	At lesst 120 minutes. (new full loaded, with temperature 25℃).
Charging time	Less than 8 hours, working model or standby
System power off	
Delayed time	5s

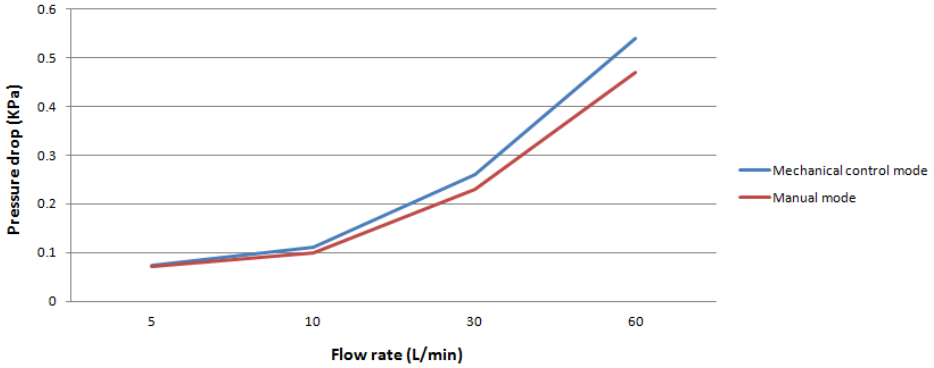
Physical specifications

LED indicator	
Alarm indicator light	one（red/yellow, when high, middle and low level alarms occurs only the red is on）
AC power indicator light	one（green, when connect with AC power）
Working indicator light	one（green, on when system is working and off when system is power off）
Battery indicator light	one（green, when connect with the battery and the AC power, it is on; working with battery it blinks and it is off when no battery or the system is off. ）
Audio indicator	
Speaker	To make alarm sound, touch warning tone, support multi grade volume.
Buzzer	To make the alarm sound when the system cannot work normally
Communications port	
Auxiliary output interface	4 PIN RJ11 socket.Nurse call. There is no user function at the port, so it can only be connected by the manufacturer.
USB（2）port	Above version of USB2.0, used for data export and software upgrade.
Standard interface for flow and pressure	8 PIN RJ45 network interface, provide 100 BASE-TX Ethernet communication channel.
ISP interface	DB 9 RS232 interface, used for updating softwave
Standard interface for electronic flowmeter	8 PIN RJ45 network interface, provide 100 BASE-TX Ethernet communication channel.
Gas monitoring module interface	Used for connecting gas monitoring module.
Network interface	8 PIN RJ45 network interface, provide 100 BASE-TX Ethernet communication channel. Software update and communication with information management system via this interface.
O2 sensor connection port	Used for connecting O2 sensor
Button	
System switch button	Press the button to start the system or keep pressing the button to turn off the system

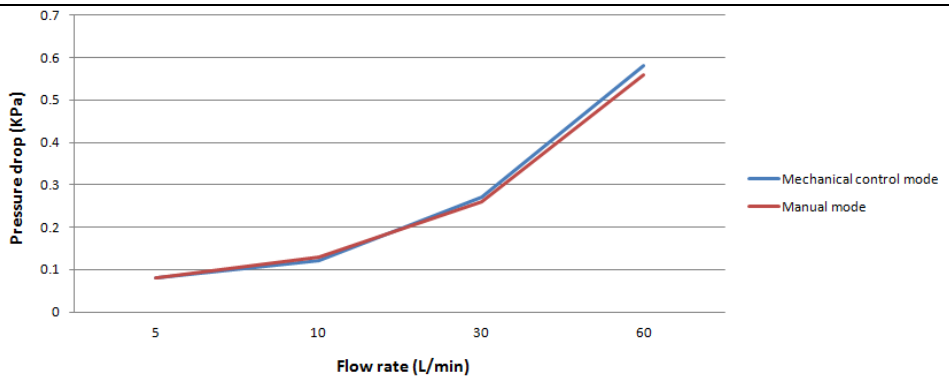
Gas specifications

Gas supply			
Pipeline gas		O2, N2O, Air	
Pipeline connector standard		ISO 5359 NIST Type	
Pipeline input pressure		0.28MPa~0.6MPa	
Gas supply pressure display		Pipeline gas supply pressure: displayed on the screen Cylinder gas supply pressure: displayed on the pressure gauge	
Pipeline gas supply pressure		scope：0～1.0MPa；resolution：0.1MPa；accuracy：±0.1MPa or ±4% of the reading, select the max. value	
Auxiliary common gas outlet（ACGO）			
connector		22mm external diameter,15mm inner diameter, cone coaxial connector	
range		Max supply 410cmH2O,flow 50L/min	
Fresh gas			
setting	Type	Electric mixer	
	Oxygen concetration	range	25～100Vol.%
		accuracy	±5% or ±2Vol.%,select the max value
	Fresh gas flow	range	0.2～10L/min
		accuracy	0.2～0.4L/min: ±0.04L/min; >0.4L/min: ±10%（20℃ and 101.3kPa）
Safety oxygen flow		type	Rotor flow meter
		range	Max supply 200kPa,flow :0～15L/min
		accuracy	±0.1L/min,or ±10% of the reading ,select the max value（20℃ and 101.3kPa）
Oxygen control			
Gas supply failure alarm			Less than 200kPa
O2 flush			35～75 L/min
Auxiliary O2 and Air supply			
Auxiliary O2 and Air supply		type	Rotor flow meter
		range	0～15L/min
		accuracy	±0.1L/min,or ±10% of the reading ,select the max value（20℃ and 101.3kPa）

Anesthetic gas delivery system

<table>
<tr><td>Bellow capacity</td><td>Total capacity is 4600mL including bellow； ventilator capacity 2730mL; gasbag capacity 1215mL.</td></tr>
<tr><td>absorber</td><td>1400mL absorber</td></tr>
<tr><td rowspan="2">Water trap</td><td>23±2mL</td></tr>
<tr><td>installation：integrated</td></tr>
<tr><td rowspan="2">Airway pressure gauge</td><td>Measurement scope：-20～100cmH2O</td></tr>
<tr><td>Measurement accuracy：±4％</td></tr>
<tr><td>Manual/Mechanical control switch</td><td>pattern：bistable</td></tr>
<tr><td>Inspiratory connector</td><td>22mm external diameter,15mminner diameter, cone coaxial connector</td></tr>
<tr><td>Expiratory connector</td><td>22mm external diameter,15mminner diameter, cone coaxial connector</td></tr>
<tr><td>Breathing bag connector</td><td>22mm external diameter,15mminner diameter, cone coaxial connector</td></tr>
<tr><td>Inspiratory and expiratory valve opening pressure</td><td>Pressure in drying condition： 0.023cmH2O； opening pressure in wet condition：0.026cmH2O</td></tr>
<tr><td rowspan="4">APLvalve</td><td>Adjusting scope ： Min～75cmH2O</td></tr>
<tr><td>Touch indication：over 30cmH_2O</td></tr>
<tr><td>Pressure flow specifications（APL fully open）
<table>
<tr><td>flow（L/min）</td><td>3</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>75</td></tr>
<tr><td>dry（cmH2O）</td><td>0.16</td><td>0.22</td><td>0.25</td><td>0.31</td><td>0.35</td><td>0.34</td><td>0.43</td><td>0.47</td></tr>
<tr><td>humid（cmH2O）</td><td>0.18</td><td>0.22</td><td>0.26</td><td>0.33</td><td>0.34</td><td>0.39</td><td>0.45</td><td>0.51</td></tr>
</table>
Starting pressure when the relative humidity is 100%（37℃）
<table>
<tr><td rowspan="2">Minimum opening pressure</td><td>In dry air</td><td>0.32cmH_2O</td></tr>
<tr><td>In humid gas</td><td>0.33cmH_2O</td></tr>
</table></td></tr>
<tr><td>Inspiratory resistance</td><td> 

resistance circuit absorption device of the expiratory system, tested in the ByPass off and ByPass on, record the max. value</td></tr>
</table>

Expiratory resistance	 resistance circuit absorption device of the inspiratory system, tested in the ByPass off and ByPass on, record the max. value
System leakage	Under 3kPa pressure（ByPass off and ByPass on）,the leakage of the breathing circuit shall be less than 150mL/min
System compliance	Under 3kPa pressure（the absorber is full of absorbent）,the anesthetic gas delivery system inner compliance shall be 80±10mL.
Soda lime canister leakage	the leakage shall be less than 50mL/min(at 75 scale)
APL valve leakage	Less than 50mL/min（APL scale at 75）

Ventilator specification

This anesthetic ventilator meets the requirements of ISO 80601-2-13:2011.

Ventilation model	V-CMV、V-SIMV、P-CMV、P-SIMV、PSV、PRVC		
Parameter scope , step length, accuracy			
parameter	range	Step length	accuracy
Tidal volume（Vt）	newbord： 10～100mL baby：100～300mL Adult：300～1500mL	1mL	10～20mL（excluding 20mL）：±5mL； 20～75mL（excluding 75mL）：±15mL； 75～1500mL: ± 20mLor ± 10% setting value, whichever error is the greater.
Pressure Limit (Plimit)	10～100cmH2O	1cmH2O	±4 cmH2O,or ±8 % of set value, whichever is the greater.
Inspiratory pressure（Pinsp）	（PEEP+5）～70cmH2O	1cmH2O	±3 cmH2O,or±12% of set value, whichever is the greater.
Pressure support（Psupp）	（PEEP+5）～50cmH2O	1cmH2O	±3 cmH2O,or ±12% of set value, whichever is the greater.
Positive end-expiratory pressure（PEEP）	0～30cmH2O	1cmH2O	<3 cmH2O,not defined; 4~30cmH2O,±2 cmH2O,or ±10% of set value, whichever is the greater.
respiratory frequency（Freq）	4～100bpm	1bpm	±1 bpm,or ±4% of set value, whichever is the greater.
Inspiratory pause（Tip:Ti）	OFF,5～60%	1%	±0.15s,or ±5% of set value, whichever is the greater.
Inspiratory/expiratory time ratio（I：E）	4:1～1:10	0.5	±15% of set value
Inspiratory time（Tinsp）	0.4～5s	0.1s	±0.2s,or ±5% of set value, whichever is the greater.
Triggering window（Trig Window）	5～95%	1%	±10%
SIMV respiratory frequency(Freq)	4～60 bpm	1 bpm	±1bpm,or ±4% of set value, whichever is the greater.
Inspiratory triggering（Trigger）	Pressure：0～-20cmH2O	-1cmH2O	±0.2cmH2O,or ±10% of set value, whichever is the greater.
	Flow：0.3～15L/min	1L/min	±1L/min,or ±10% of set value
Standby time（FreqMin）	2～60bpm	1bpm	±1bpm,or ±4% of set value, whichever is the greater.
Pressure rise time（Tslope）	0～2s	0.1s	±0.3s
Ventilator performance			
Driven pressure			0.28～0.6MPa
Flow peak value			120L/min
Flow valve range			1～120L/min
Parameter monitoring			
parameter	range	resolution	accuracy
Tidal volume（Vt）	0～2500mL	1mL	10～75mL（excluding 75mL）：±12mL； 75～1500mL（excluding 1500mL）：±15mL or ±10% display value； 1500 ～ 2500mL: ± 20mLor ± 200% display value, whichever error is the greater.
Minute ventilation（MV）	0.1～99.9L/min	0.L/min	±0.15l/min, or ±10% of the reading,whichever error is the greater.

Respiratory frequency（Freq）	0～100bpm	1bpm	±1bpm,or ±5% actual reading value,whichever error is the greater.
Inspiratory to Expiratory Ratio I:E	4: 1-1: 10	0.5s	2:1～1:4 (excluding 2:1 and 1:4)：±10%； 4:1～2:1 and 1:4 ～1:10：±25% actual reading value.
Fraction of inspired oxygen（FiO2）	15～100%(V/V)	1%	± (2.5 Vol% + 2.5% of reading）
Air resistance (Raw)	0 ～ 250 cmH2O/(L/s)	1 cmH2O/(L/s)	0～20cmH2O/(L/s)：±10cmH2O/(L/s)；20 ～ 250cmH2O/(L/s)：±50% actual reading value.
Dynamic compliance（Cydn）	0～250 ml/cmH2O	1 ml/cmH2O	±(10mL/cmH2O+±20% actual reading value)
Air way peak pressure（Ppeak）	0～100cmH2O	0.1cmH2O	±（2＋4% of the reading）
Plat pressure（Pplat）	0～100cmH2O	0.1cmH2O	±（2＋4% of the reading）
Positive end-expiratory pressure（PEEP）	0～30cmH2O	0.1cmH2O	±（2＋4% of the reading）
Airway pressure waveform	-20～100cmH2O	/	/
Volume waveform	0～1.6L	/	/
Respiration flow velocity waveform	-120～120L/min	/	/
ETCO2 waveform	0～100mmHg	/	/

Alarm setting			
parameter		range	step
FiO2	alarm upper limit	（lower limit+2）～100%	1%
	alarm lower limit[a)]	18～（upper limit-2）%	1%
Ppeak	alarm upper limit	（lower limit +2）～100cmH2O	1cmH2O
	alarm lower limit	0～（upper limit -2）cmH2O	1cmH2O
Vt	alarm upper limit	（lower limit +5）～2000mL	1mL
	alarm lower limit	0～（upper limit -5）mL	1mL
Apnea	Mechanical control	20s	/
	Manual control	60s	/
Sustained Airway Pressure[b)]	(PEEP+10) cmH2O		1cmH2O
MV	alarm upper limit	（lower limit +0.1）～100L/min	0.1l/min
	alarm lower limit	0.0～（upper limit -0.1）L/min	0.1l/min
Freq	alarm upper limit	（lower limit +2）～100 bpm	1bpm
	alarm lower limit	0～（upper limit -2）bpm	1bpm

a Pressure lower limit alarm delay time is (4-10)s.
b Continuous pressure limit value above (PEEP+10), lasting time (15+1)s.

Anesthetic vaporizer specification

Anesthetic vaporizer（refers to the user manual of vaporizer）	
Vaporizer type	Penlon Sigma Delta （ Enflurane, Isoflurane, sevoflurane and hanlothane） or Drager（Vapor 2000 for Enflurane、Vapor 2000 for Isoflurane、Vapor2000 for Sevoflurane、Vapor2000 for Halothane）(optional)
position	Single or dual（optional）
Installation	Selectatec®,with interlock （ Selectatec® is the trademark of Ohmeda）

AGSS Transfer and Receiving System Specifications

Passive exhaust system	
Negative pressure	0.3cmH2O
Outlet connector	30mm external diameter cone connector
Active anesthetic gas scavenging system	
size	443x145x140mm（L×W×H）
Delivery and absorption system model	Low discharge collection system
Extract flow	25～50L/min
Pressure	<2kPa@25L/min；>1kPa@50L/min
Pressure release device	compensates for barometric pressure
filter	Non-stainless steel net,pore diameter 140～150μm
Delivery and absorption status	The float drops when the system is not working or the air exhaust speed is less than 25L/min
Spillage flow	Before an spillage occurs, the maximum constant flows to be 35L/min,intermittent flows to be 75L/min.
Delivery and absorption system connector	BS6834 connector（standard）,other model connectors are optional

Oxygen sensor specification

Oxygen sensor[1)]	
Signal Output	9-13 mV
Response Time	< 15s
Operating Range	0 to 45° C
Operating pressure	75kPa～125kPa
Humidity	0-100% , Non-Condensing
Storage Temperature	-20 to 50°C
Compensation	Automatic compensation pressure and temperature
Measurement range	0～100%
Warm up time	<60s
Linearity	≤2%,5min in pure oxygen environment
Stability	<1% Measurement accuracy drift per month（air environment）
Repeatability	±1%,5min in pure oxygen environment
Normal life	>5x10^5 when measuring

Gas monitoring module specification

type	Plug and play			
Measurement model	Gas monitoring module			
Preheating time	sidestream：<20s mainstream ：<30s			
Total response time	sidestream：<3s(sampling pipe length:2m) mainstream ：≤3s			
Pressure risetime	sidestream（50mL/min flow speed）：CO2：≤200ms,O2（optional）：≤450ms2,N2O：≤350ms,ENF、ISO、SEV、 DES、 HAL：≤350ms mainstream （10L/min flow speed）：CO2：≤90ms,O2（optional）：≤300ms,N2O：≤300ms,ENF、ISO、SEV、 DES、 HAL：≤300ms			
Sampling flow	sidestream：50±10mL/min			
Monitoring gas	CO2,O2（optional）, N2O, and one of the five anesthetic agent of Des,Iso,Enf,Sev and Hal			
compensation	sidestream：automatic compensation of pressure, temperature and CO2 broaden effection			
Calibration	sidestream：no need to operate calibration. Automatically zero when starts. mainstream ：no need to operate calibration, to zeroing when replace the airway adapter.			
Measurement scope and accuracy （ standard condition）	gas	scope	accuracy	resolution
	CO2	0～13Vol%	±(0.43Vol%+8% of the reading)	0.1Vol%
	N2O	0～100Vol%	±(2Vol%+8% of the reading)	0.1Vol%
	O2（optional）	0～100%	±(2.5Vol%+2.5% of the reading)	1%
	ENF	0～8Vol%	±(0.2Vol%+15% of the reading)	0.1Vol%
	SEV	0～10Vol%	±(0.2Vol%+15% of the reading)	0.1Vol%
	ISO	0～8Vol%	±(0.2Vol%+15% of the reading)	0.1Vol%
	HAL	0～8Vol%	±(0.2Vol%+15% of the reading)	0.1Vol%
	DES	0～15Vol%	±(0.2Vol%+15% of the reading)	0.1Vol%
	The above accuracy is applied for the dry gas when 22℃±5℃,1013±40hPa			
measurement accuracy （ all conditions）	gas	accuracy	gas	accuracy
	CO2	±(0.3vol%+4% of the reading)	ISO	±(0.2vol%+10% of the reading)
	N2O	±(2vol%+5% of the reading)	SEV	±(0.2vol%+10% of the reading)
	O2	±(2vol%+2% of the reading)	HAL	±(0.2vol%+10% of the reading)
	ENF	±(0.2vol%+10% of the reading)	DES	±(0.2vol%+10% of the reading)
	1) accuracy specification is valid under the specified temperature and humidity. not including the following“interference gas and water vapor affection”; 2) the accuracy specification is invalid if there are more than 2 kinds of anesthetic gas and will send the alarm.			
Accuracy drifting	sidestream：in confirmity with the accuracy requirements within 8 hours mainstream ：in confirmity with the accuracy requirements within 24hours			
Breath detection	Sidestream, mainstream: Adaptive threshold, minimum 1 vol% change in CO2 concentration.			
Respiration rate	Sidestream: 0 to 150±1 breaths/min Mainmun: 0 -150 bpm. The respiration rate is displayed after three breaths and the average value is updated every breath.			

Main anesthetic gas threshold value	0.15Vol%, after the recognition of the anesthetic gas, the system will read the concentration if the apnea is detected even the concentration is lower than 0.15Vol%.
Anesthetic gas recognition time	<20s（usually<10s）
Auxiliary anesthetic gas threshold value	0.2Vol.%+10% of the total anesthetic gas concentration
Power input	Only in the 4.5～5.5VDC, voltage fluctuation. Otherwise may lead to incorrect measurments or monitor damaged.
Size and weight	sidestream：33X78X49mm,130g（with cable） mainstream ：38X37X34mm,<25g（without cable）

Interference gas and water vapour influence

Gas or water vapour	gas concentation	CO2	Air	Anesthetic gas
N20[4)]	60vol%	-[1&2)]	-[1&2)]	-[1)]
Halothane[4)]	4vol%	-[1)]	-[1)]	-[1)]
Isoflurane, Sevoflurane, Enflurane[4)]	5vol%	-[1)]	-[1)]	-[1)]
Desflurance[4)]	15vol%	-[1)]	-[1)]	-[1)]
He[4)]	50vol%	-6% of the reading[3)]	-[1)]	-[1)]
Xe[4)]	80vol%	-10% of the reading[3)]	-[1)]	-[1)]
Quantitive spray[4)]	Not for the quantitive spray[6)]			
Ethyl Alcohol[4)]	0.3vol%	-[1)]	-[1)]	-[1)]
Isopropanol[4)]	0.5vol%	-[1)]	-[1)]	-[1)]
Acetone[4)]	1vol%	-[1)]	-[1)]	-[1)]
Methane[4)]	3vol%	-[1)]	-[1)]	-[1)]
NO[5)]	0.02vol%	-[1)]	-[1)]	-[1)]
CO[5)]	1vol%	-[1)]	-[1)]	-[1)]
O2[5)]	100vol%	-[1&2)]	-[1&2)]	-[1)]

Note 1：in the above “measurement range and accuracy（all conditions）”including the negligible interference and influence.

Note 2：in the above “measurement range and accuracy（all conditions）”including the negligibleinterference and influence when set the N2O/O2 concentration.

Note 3：The interference of the gas concentration is as：50vol% He usually decreases 6% readingofthe CO2, which means that if the measurment including the 5.0vol% CO2 and 50vol% He, the acutual measured CO2 concentration is（1-0.06）X5.0vol%=4.7vol% CO2；

Note 4：in confirmity with the standard of ISO 80601-2-55,
Note 5：in confirmity with the standard of ISO 80601-2-55,

Note 6：IRMA CO2(not for quantitive spray)；ISA CO2 (quantitive spray) .

Alarm upper and lower limit value setting		
Alarm specification	**Setting range**	**resolution**
FiENF alarm upper limit	（ lower limit+0.1）～5.0%(V/V)	0.1%(V/V)
FiENF alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1 %(V/V)
EtENF alarm upper limit	（ lower limit+0.1）～5%(V/V)	0.1%(V/V)
EtENF alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1%(V/V)
FiISO alarm upper limit	（ lower limit+0.1）～5.0%(V/V)	0.1%(V/V)
FiISO alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1 %(V/V)
EtISO alarm upper limit	（ lower limit+0.1）～5%(V/V)	0.1%(V/V)
EtISO alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1%(V/V)
FiSEV alarm upper limit	（ lower limit+0.1）～8.0%(V/V)	0.1 %(V/V)
FiSEV alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1 %(V/V)
EtSEV alarm upper limit	（ lower limit+0.1）～8%(V/V)	0.1%(V/V)
EtSEV alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1%(V/V)
FiHAL alarm upper limit	（ lower limit+0.1）～5.0%(V/V)	0.1%(V/V)
FiHAL alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1%(V/V)
EtHAL alarm upper limit	（ lower limit+0.1）～5%(V/V)	0.1%(V/V)
EtHAL alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1%(V/V)
FiDES alarm uppler limit	（ lower limit+0.1）～18.0%(V/V)	0.1%(V/V)
FiDES alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1%(V/V)
EtDES alarm upper limit	（ lower limit+0.1）～18%(V/V)	0.1%(V/V)
EtDES alarm lower limit	0～（ upper limit-0.1）%(V/V)	0.1%(V/V)
FiN2O alarm upper limit	（ lower limit+1）～82%(V/V)	1%(V/V)
FiN2O alarm lower limit	0～（ upper limit-1）%(V/V)	1%(V/V)
EtN2O alarm upper limit	（ lower limit+1）～82%(V/V)	1%(V/V)
EtN2O alarm lower limit	0～（ upper limit-1）%(V/V)	1%(V/V)
FiCO2 alarm upper limit	0.0～19.7 %(V/V)	0.1 %(V/V)
EtCO2 alarm upper limit	（ lower limit+0.1）～19.7 %(V/V)	0.1 %(V/V)
EtCO2 alarm lower limit	0.0～（ upper limit-0.1）%(V/V)	0.1 %(V/V)
awRR alarm upper limit	（ lower limit+1）～150 bpm	1 bpm
awRR alarm lower limit	0～（ upper limit-1）bpm	1 bpm

System default setting

CO2 module

CO2 module		factory default setting		
		adult	pediatric	neonate
setting	unit	mmHg	mmHg	mmHg
	Work model	measurement	measurement	measurement
	Module configuration	open	open	open
Alarm setting	Alarm level	medium	medium	medium
	FiCO2 alarm uppler limit（mmHg）	4	4	4
	EtCO2 alarm uppler limit（mmHg）	50	50	50
	EtCO2 alarm lower limit（mmHg）	15	20	20
	awRR alarm uppler limit（bpm）	30	30	30
	awRR alarm lower limit（bpm）	8	8	8

AG module

CO2 module		**factory default setting**		
		adult	**pediatric**	**neonate**
setting	Work model	measurement	measurement	measurement
	Module configuration	open	open	open
Alarm setting	Alarm level	medium	medium	medium
	FiCO2alarm uppler limit（mmHg）	4	4 mmHg	4 mmHg
	EtCO2alarm uppler limit（mmHg）	50	50mmHg	50mmHg
	EtCO2 alarm lower limit（mmHg）	15	20mmHg	20mmHg
	awRR alarm uppler limit（bpm）	8	8	8
	awRR alarm lower limit（bpm）	30	30	30
	FiN2O alarm lower limit	0	0	0
	FiN2O alarm uppler limit	53	53	53
	EtN2O alarm lower limit	0	0	0
	EtN2O alarm uppler limit	55	55	55
	FiISO alarm uppler limit	2.0	2.0	2.0
	FiISO alarm lower limit	0.0	0.0	0.0
	EtISO upper limit	3.0	3.0	3.0
	EtISO lower limit	0.0	0.0	0.0
	FiSEV alarm uppler limit	5.0	5.0	5.0
	FiSEV alarm lower limit	0.0	0.0	0.0
	EtSEV upper limit	6.0	6.0	6.0
	EtSEV lower limit	0.0	0.0	0.0
	FiENF alarm uppler limit	2.0	2.0	2.0
	FiENF alarm lower limit	0.0	0.0	0.0
	EtENF upper limit	3.0	3.0	3.0
	EtENF lower limit	0.0	0.0	0.0
	FiDES alarm uppler limit	6.0	6.0	6.0
	FiDES alarm lower limit	0.0	0.0	0.0
	EtDES upper limit	8.0	8.0	8.0
	EtSES lower limit	0.0	0.0	0.0
	FiHAL alarm uppler limit	2.0	2.0	2.0
	FiHAL alarm lower limit	0.0	0.0	0.0
	EtHAL upper limit	3.0	3.0	3.0
	EtHAL lower limit	0.0	0.0	0.0

Ventilator

Ventilation mode	parameter	Factory default setting		
		adult	pediatric	neonate
V-CMV	Vt	600ml	120ml	20ml
	Freq	8bpm	15bpm	20bpm
	I:E	1:2	1:2	1:2
	Tip:Ti	10%	10%	10%
	Plimit	50cmH2O	40cmH2O	20cmH2O
	PEEP	0	0	0
V-SIMV	Vt	600ml	120ml	20ml
	Freq	8bpm	15bpm	20bpm
	Tinsp	2.0s	1.0s	1.0s
	Tip:Ti	10%	10%	40%
	Psupp	8cmH2O	5cmH2O	5cmH2O
	Trigger	3l/min	2l/min	2l/min
	Tslope	0.2s	0.2s	0.2s
	Plimit	50cmH2O	40cmH2O	20cmH2O
	PEEP	0	0	0
	Trig Window	25%	25%	25%
P-CMV	Pinsp	15cmH2O	10cmH2O	10cmH2O
	Freq	8bpm	15bpm	20bpm
	I:E	1:2	1:2	1:2
	Tslope	0.2s	0.2s	0.2s
	Plimit	50cmH2O	40cmH2O	20cmH2O
	PEEP	0	0	0
P-SIMV	Pinsp	15cmH2O	10cmH2O	10cmH2O
	Freq	8bpm	15bpm	20bpm
	Tinsp	2.0s	1.0s	1.0s
	Tslope	0.2s	0.2s	0.2s
	Psupp	8cmH2O	5cmH2O	5cmH2O
	Trigger	3lpm	2lpm	2lpm
	Plimit	50cmH2O	40cmH2O	20cmH2O
	PEEP	0	0	0
	Trig Window	25%	25%	25%
PSV	Psupp	8cmH2O	5cmH2O	5cmH2O
	FreqMin	4bpm	6bpm	12bpm
	Trigger	3lpm	2lpm	2lpm
	Tslope	0.2s	0.2s	0.2s
	Plimit	50cmH2O	40cmH2O	20cmH2O
PRVC	Vt	600ml	120ml	20ml
	Freq	8bpm	15bpm	20bpm
	I:E	1:2	1:2	1:2
	Tslope	0.2s	0.2s	0.2s
	Plimit	50cmH2O	40cmH2O	20cmH2O
	PEEP	0	0	0

Parameter alarm				
		adult	**pedicatric**	**neonate**
FiO_2	alarm uppler limit	100%	100%	100%
	alarm lower limit	21%	21%	21%
Paw	alarm uppler limit	50cmH2O	40cmH2O	40cmH2O
	alarm lower limit	10cmH2O	8cmH2O	8cmH2O
Vt	alarm uppler limit	1000mL	300mL	100mL
	alarm lower limit	50mL	10mL	10mL
MV	alarm uppler limit	12L/min	6L/min	6L/min
	alarm lower limit	1L/min	1L/min	0.2L/min
Rate	alarm uppler limit	40bpm	60bpm	40bpm
	alarm lower limit	2bpm	2bpm	2bpm
Apnea alarm time	Alarm limit time	20s	20s	20s
Continuous airway pressure alarm	Alarm value	10cmH2O	10cmH2O	10cmH2O

System configuration

Configuration Item	Factory default setting	configuration	factory default setting
Flow meter standard	USA	Driven gas	oxygen
Module configuration	AG/CO2 module	O2 flush soft key	OFF

Safety specification

According to IEC 60601-1 safety regulations	
Protection against electric shock	Type I with internal power supply
Protection against electric shock grad	Type BF no protection of defibrillation
Liquid invade protection	Normal device（no protection against liquid invasion）
Explosion proof	Do not use the flammable anesthetic agent
Work model	Continuous operation
Mobility	Moveable with trundles

Toxic or hazardous substances or elements

Part name		Cd	Hg	Pb	Cr(VI)	PBB	PBDE
Display shell	Front shell	○	○	○	○	○	○
	Turned parts	○	○	○	×	○	○
	button	○	○	○	○	○	○
screen	Touch screen	×	×	×	×	×	×
Main unit	Main unit turned parts	○	○	○	×	○	○
	Internal connecting cable	○	○	○	○	○	○
	PCBA	○	○	×	○	○	○
	Isolation transformer	○	○	×	○	○	○
	Face label	○	○	○	○	○	○
	label	○	○	○	○	○	○
Common used	Connection parts	○	○	○	×	○	○
	Power cable	○	○	○	○	○	○
	air pipe	○	○	○	○	○	○
package	Packing materials	○	×	×	○	×	×
battery	Li battery	×	×	×	×	×	×
circuit	Circuit main unit	○	○	×	×	○	○
accessories	Cylinder decompressor	○	○	○	○	○	○
	mask	○	○	○	○	○	○
	corrugated pipe parts	○	○	○	○	○	○
	Airy supply soft pipe parts	○	○	○	○	○	○
	Gas bag	○	○	○	○	○	○
	soda lime canister	○	○	○	○	○	○
	High tempreature resistance connector	○	○	○	○	○	○
	vaporizer	○	○	×	○	○	○
	cylinder	○	×	×	○	○	○
	Oxygen sensor	○	○	×	○	○	○
	Flow sensor	○	○	○	○	○	○
	CO2 accessory	○	○	×	○	○	○
	AG accessory	○	○	×	○	○	○

×：hazardous substance or element is found from one homogeneous material in one part and it is out of the limit of SJ/T11363-2006

○： hazardous substance or element from one homogeneous material in one part is within the limit of SJ/T11363-2006

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Thank you for using S6600 Anaesthesia System

Please read the manual carefully before operation, and keep the manual properly for reference.

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