

Veta 5/Veta 5Plus

Veterinary Anesthesia Machine

Operator's Manual



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- The product is used in accordance with the instructions for use.

WARNING

- **It is important for the hospital or organization that employs this equipment to carry out a reasonable service/maintenance plan. Neglect of this may result in machine breakdown or personal injury.**
 - **This equipment must be operated by skilled/trained clinical professionals.**
-

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Preface

Manual Purpose

This manual contains the instructions necessary to operate the product safely and in accordance with its function and intended use. Observance of this manual is a prerequisite for proper product performance and correct operation and ensures animal and operator safety.

This manual is based on the maximum configuration and therefore some contents may not apply to your product. If you have any question, please contact us.

This manual is an integral part of the product. It should always be kept close to the equipment so that it can be obtained conveniently when needed.

Intended Audience

This manual is geared for clinical professionals or veterinarian who are expected to have a working knowledge of medical procedures, practices and terminology as required for monitoring of critically ill animals.

Illustrations

All illustrations in this manual serve as examples only. They may not necessarily reflect the setup or data displayed on your anesthesia machine.

Conventions

- *Italic* text is used in this manual to quote the referenced chapters or sections.
- **Bold** text is used to indicate the screen texts and names of hard keys.
- → is used to indicate operational procedures.

Password

A password is required to access different menus within the anesthesia machine.

System menu: 1234

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1 Safety

1.1 Safety Information

WARNING

Indicates a potential hazard or unsafe practice that, if not prevented, could result in death, serious injury or property damage.

CAUTION

Indicates a potential hazard or unsafe practice that, if not prevented, could result in minor personal injury, product fault, damage or property loss.

NOTE:

Highlights important precautions and provides descriptions or explanations for better use of this product.

1.1.1 Warnings

WARNING

- **Do not operate the anesthesia machine before reading this manual.**
- **Before operation, ensure that the machine, connecting cables, and accessories are in correct working order and operating condition.**
- **The equipment must be connected to a properly installed power outlet with protective earth contacts only. If the installation does not provide for a protective earth conductor, disconnect it from the power cord or operate with the equipment's internal battery supply.**
- **Connect the anesthesia machine to an AC power source before the internal battery power source is depleted.**
- **Do not use the machine in the presence of flammable or explosive materials to prevent fire or explosion.**
- **Do not open the case of the machine, as you may suffer an electric shock. All servicing and upgrading operations of the machine must be carried out only by the trained and authorized personnel.**
- **Fresh gas flow must never be switched off before the vaporizer is switched off. The vaporizer must never be left switched on without a fresh-gas flow. Otherwise, anesthetic agent vapor at a high concentration can get into the machine lines and ambient air, causing harm to people and materials.**

- Before moving the anesthesia machine, remove the objects from the top shelf and bracket to prevent the system from tilting.
 - Disconnect the power supply before repairing the machine.
 - Do not use the anesthesia machine when there is leakage in the breathing system.
 - Check the specifications of the Anesthetic Gas Scavenging System (AGSS) processing system and the specifications of the anesthesia machine to ensure compatibility and to prevent a mismatched processing system.
 - A hazard may exist due to the use of improper connectors. Ensure all assemblies use the proper connectors.
 - Single use breathing tubes, soda lime, watertraps, sampling tubes and other single use items may be considered potential biologically hazardous items and should not be reused. Dispose of these items in accordance with hospital policy and local regulations for contaminated and biologically hazardous items.
 - The top shelf should not be used to push or lift the machine.
 - Do not use anti-static masks or breathing tubes.
 - Cross infection may be caused if the anesthesia machine is used without timely disinfection.
 - Do not clean or repair the machine during operation.
 - The mains plug is used to isolate the anesthesia vaporizer electrically from the supply mains. Do not place the anesthesia machine to a place where it is difficult to operate the plug.
 - All analog or digital equipment connected to this system must be certified passing the specified IEC standards (such as IEC 62368-1 for data processing equipment and IEC 60601-1 for medical electrical equipment). All configurations shall comply with the valid version of IEC 60601-1. The personnel who are responsible for connecting the optional equipment to the I/O signal port shall be responsible for medical system configuration and system compliance with IEC 60601-1.
 - Do not touch the animal when connecting external devices via the I/O signal ports to prevent animal leakage current from exceeding the requirements specified by the standard.
-

1.1.2 Cautions

CAUTION

- Use only the accessories specified in this manual to ensure animal safety.
- Dispose of the machine and its accessories that approach the end of service life in compliance with applicable local laws and regulations or hospital regulations.
- Electromagnetic field may affect the equipment performance. Therefore, other devices used in the vicinity of the machine must meet corresponding EMC requirements. Mobile phones and X-ray or MRI Machine are possible sources of interference as they emit higher levels of electromagnetic radiation.
- This system is capable of operating properly at the interference levels indicated in this manual. Higher levels of interference may trigger alarms and even stop automatic ventilation. Please keep the equipment away from high-intensity electric fields which may cause the system to issue false alarms.
- Ensure that the voltage and frequency of the power supply fall into the specified ranges on the equipment's label or in this manual before connecting the equipment to a power supply.
- Always install or transfer the machine carefully to prevent the machine from fall, collision, violent vibration or other damage from external mechanical force.
- In standard configuration, the anesthesia machine can maintain stable when it is tilted at 10 degrees. Do not hang objects on two sides of the machine in case of tipping.



- **Fix the equipment on the top shelf securely to prevent unexpected sliding.**
- **Prevent or avoid using and storing the gas supply hose assembly in an environment exposed to ultraviolet light or oxidizing agents, or in a high-temperature or moist environment to avoid damage to people and materials because of the release of pressure from aged hoses in the assembly.**
- **The machine is not suitable for use in a magnetic resonance imaging (MRI) environment.**
- **Use the power cord provided with the product.**
- **Unintended movement may occur if the casters are not locked. Casters should be locked during operating the machine.**
- **When using the oxygen generator for gas supply, empty the humidifier.**

















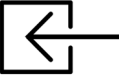










1.1.3 Notes






NOTE:










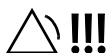


- Put the machine in a location that facilitates observation, operation and maintenance. During operation, stay right in front of the machine within four meters away from the display to facilitate observation of the displayed information on the machine.
- Keep this manual somewhere near the machine for convenient and prompt access.
- This manual describes the product for the purpose of fully covering its functions and configuration options, and the product you have purchased may not support part of these functions or configuration options.
- The battery supply of this machine is not a user serviceable component. Only an authorized service representative can replace the battery supply. If the system is not used for a long time, contact the Customer Service Department or sales representative to have the battery supply disconnected. At the end of the battery life, dispose of the battery in accordance with local regulations.
- Some alarm settings on this machine are not configurable by users.
- When the Compliance Compensation is Off, the tidal volume may not reach the set value.
- For animals with abnormal compliance, the actual input tidal volume may deviate the intended setting tidal volume during ventilation.
- When the gas supply is sufficient and the flowmeter is open, the alarm message “No Fresh Gas” is still shown during ventilation; or the message “Fresh Gas is On” is shown in stand-by mode even though the flowmeter is turned to zero, please zeroing the flow sensor.
- After the installation of anesthesia machine or the replacement of the main control board, reset the altitude according to local altitude, or the tidal volume may be inaccurate.

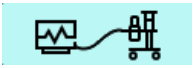
1.2 Device Symbols

Symbol	Description	Symbol	Description
	Refer to instruction manual/ booklet		General warning sign




Symbol	Description	Symbol	Description
	Not autoclavable	IPX1	Protected against vertically falling water drops
	Unlock		Lock
MIN	Minimum value	MAX	Maximum value
	Gas outlet		Flow or pressure control knob
	Temperature limit		Humidity limitation
	Atmospheric pressure limitation		Keep dry
	This way up		Fragile, handle with care
	Recyclable		Stacking limit by number
	Manufacturer		Date of manufacture
	No pushing	O₂⁺	O ₂ flush button
	Gas inlet		ACGO switch
	Manual bag connector	↓INSPIRATORY↓	Inspiration end
O₂ 	Oxygen supply connector	AIR 	Air supply connector
	Alternating current		Protective earth (ground)
	Power switch		Battery LED
	Manual ventilation		Auto ventilation

Symbol	Description	Symbol	Description
	CE marking		UKCA marking
	The following definition of the WEEE label applies to EU member states only: the use of this symbol indicates that waste electrical and electronic equipment must not be disposed of as unsorted municipal waste and must be collected separately. By ensuring that this product is disposed of correctly, you will help prevent bringing potential negative consequences to the environment and human health. For more detailed information with regard to returning and recycling this product, consult the distributor from whom you purchased the product.		Defibrillation-proof type BF applied part
	Serial number	/	/

Symbol	Description	Symbol	Description
	Battery is fully charged. AC power is connected and it is powering the system.		Battery is partially charged. AC power is connected. It is charging the battery and powering the system.
	Battery is fully charged and it is powering the system. AC power is not connected.		Battery is partially charged and it is powering the system. AC power is not connected.
	Battery level is low and it is powering the system. Recharging recommended. AC power is not connected.		Battery is not installed
	Alarm audio pause icon		Low priority message
	Medium priority message		High priority message
	Wired network is connected.		Wired network is not connected.

Symbol	Description	Symbol	Description
	Connected to the monitor successfully, and CO ₂ data comes from the monitor.	/	/

The general meaning assigned to geometric shapes, safety colors and contrast colors for safety signs are as follows:

Geometric shape	Meaning	Safety color	Contrast color	Graphical symbol color
	Prohibition	Red	White	Black
	Mandatory action	Blue	White	White
	Warning	Yellow	Black	Black

2 Overview

2.1 Introduction

2.1.1 Intended Use

The anesthesia machine supplies anesthetic agents to the animals and provides respiratory support.

WARNING

- **The anesthesia machine cannot be used in an MRI environment.**
 - **The anesthesia machine should be operated by professional and trained anesthetists.**
-

2.1.2 Contraindications

Not identified yet.

2.1.3 Product Description

The anesthesia machine consists of a main unit, anesthetic ventilator, anesthetic gas delivery system, anesthetic vaporizer, anesthetic breathing system (including the airway pressure gauge, bellows, CO₂ absorbent canister, inspiratory and expiratory check valves, APL valve and Auto/Manual switch), Anesthetic Gas Scavenging System (AGSS), CO₂ gas monitoring module and accessories. The anesthetic machine is applicable to the animal environment. The applied parts of the anesthesia machine are masks and breathing tubes.

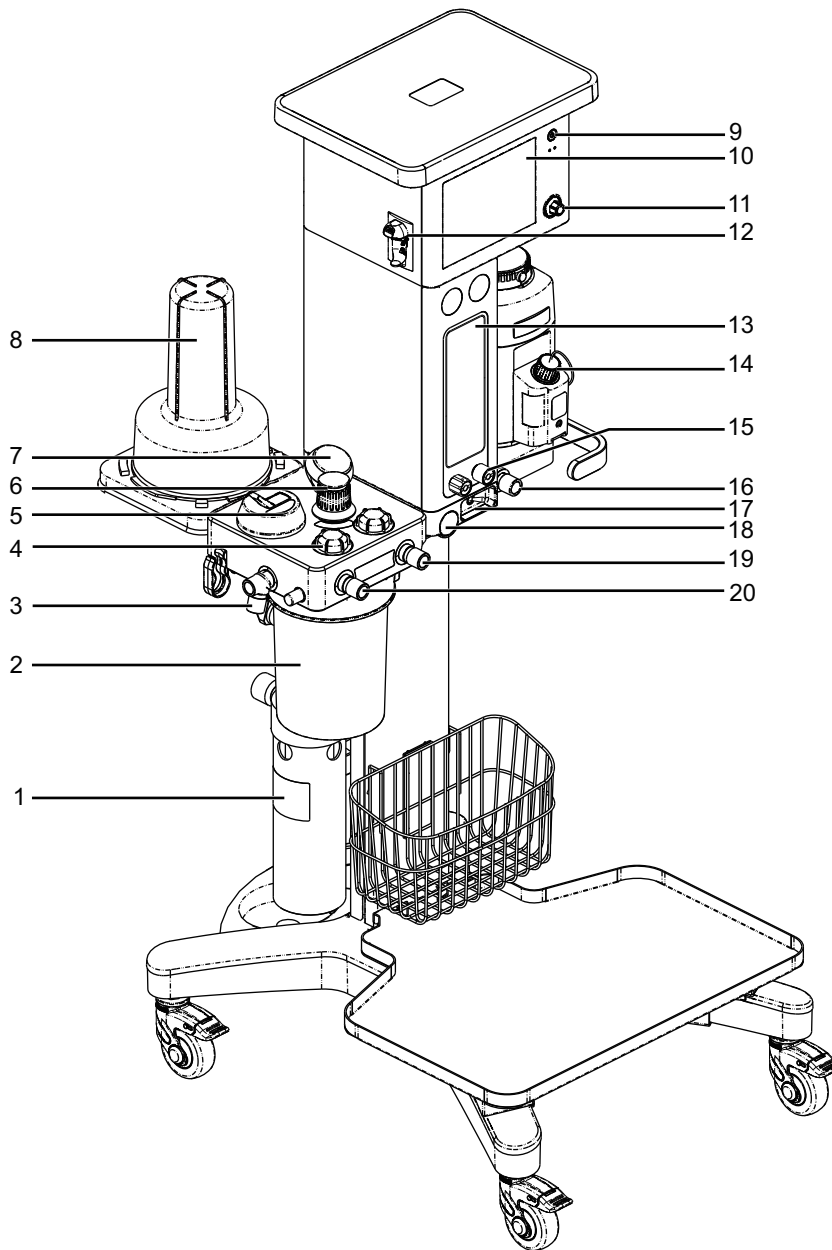
The anesthesia machine provides the following ventilation modes:

- Volume Support Ventilation (VS)
- Target Adaptive Volume Support (TAVS, “VS+” for Short)
- Volume Control Ventilation (VCV)
- Pressure Control Ventilation (PCV)
- Synchronized Intermittent Mandatory Ventilation (SIMV)
- Manual Ventilation
- Non-rebreathing ventilation

2.2 Equipment Views

Refer to the accompanied Installation Guide to install this anesthesia machine.

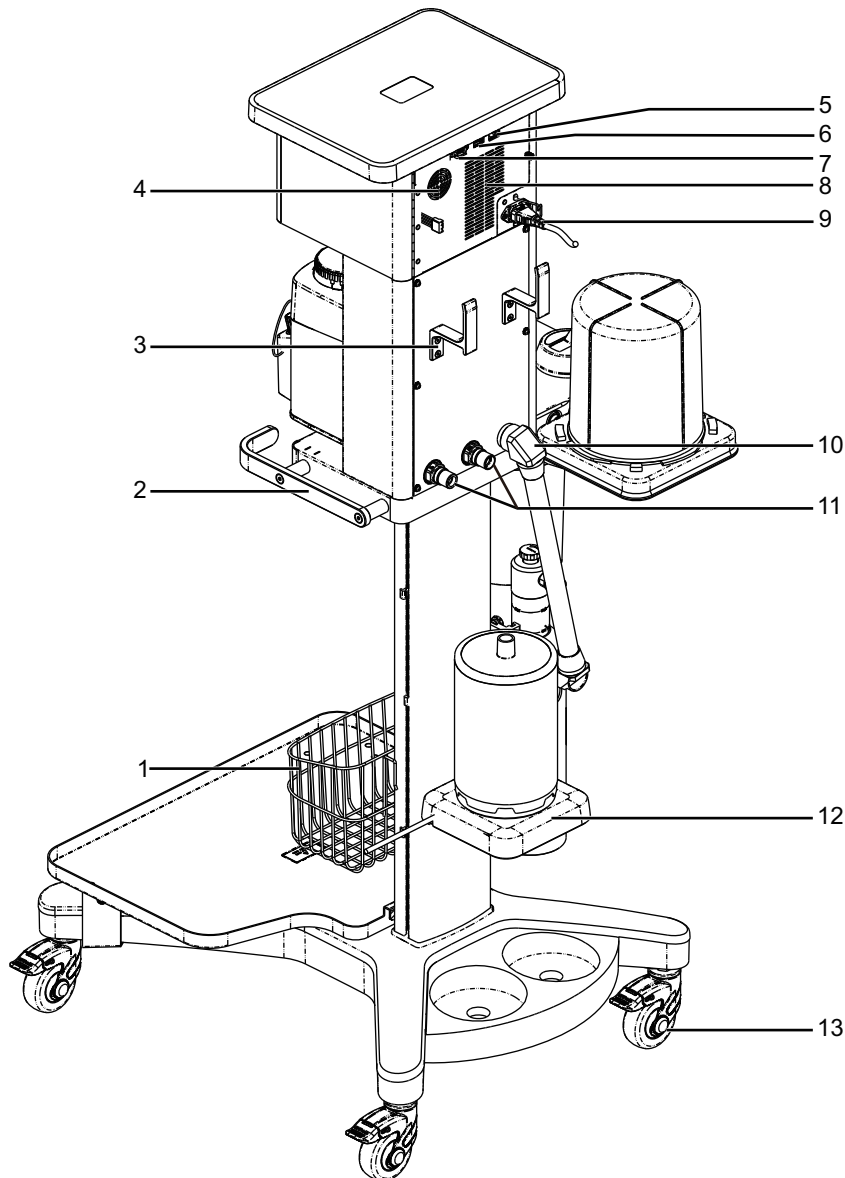
2.2.1 Main Unit (Front View)



No.	Components	Description
1.	AGSS System	Used to discharge waste gas.
2.	CO ₂ absorbent canister	The container for holding the CO ₂ absorbent.
3.	Reservoir bag connector	Connects to the reservoir bag for manual ventilation.
4.	Observation window of expiratory/inspiratory check valve	Used to observe the status of expiratory and inspiratory check valves from outside the equipment.
5.	Auto/Manual switch	Used to switch between the automatic ventilation and manual ventilation modes.

No.	Components	Description
6.	APL valve	A rotary regulator for setting the pressure limit of the breathing system during manual ventilation. The scales on the APL valve indicate approximate pressure. Rotating the APL valve clockwise will increase the pressure limit and rotating it counterclockwise will decrease the pressure limit. The pressure limit will increase by 30 cmH ₂ O after pressing the APL valve and return to the original pressure after releasing.
7.	Airway pressure gauge	Indicates the airway pressure.
8.	Bellows	Used to separate the air of breathing system and drive gas. The bellows housing is a transparent cover with scale lines. These scale lines are only for information. It is recommended to read the tidal volume from the system screen. The tidal volume delivered is the sum of the bellows output and the fresh gas flow.
9.	System switch	Used to switch on or off the system.
10.	Display	Shows the software interface of the ventilator system. Selecting and changing settings is allowed by clicking the screen.
11.	Master control knob	Press the control knob to select menu items or confirm settings. Rotate clockwise or counterclockwise to scroll through menu items or change settings.
12.	CO ₂ module watertrap connector	Used to install the watertrap.
13.	Flowmeter	Shows the flow of O ₂ or air. NOTE: Take the top level of the floater as the reference when reading.
14.	Vaporizer	The vaporizer can accurately feed the anesthetic agent into anesthesia breathing system at certain concentration. Each vaporizer is calibrated for a specified anesthetic agent and is only suitable for that anesthetic agent. The specific agent that the vaporizer must be used is marked in text and by specific color on the vaporizer.
15.	Flowmeter control knob	Rotate the knob to adjust the flow.
16.	ACGO separate outlet	Outputs the fresh gas.
17.	ACGO (Auxiliary Common Gas Outlet) switch	Used to enable/disable the ACGO function and output fresh gas through ACGO connector.
18.	O ₂ flush button	Used to provide fixed O ₂ flow for the inspiratory branch of the breathing system. Please note that the animal should be disconnected with the machine when pressing the O ₂ flush button.
19.	Inspiratory branch	Inspiration connector.
20.	Expiratory branch	Expiration connector.

2.2.2 Main Unit (Rear View)



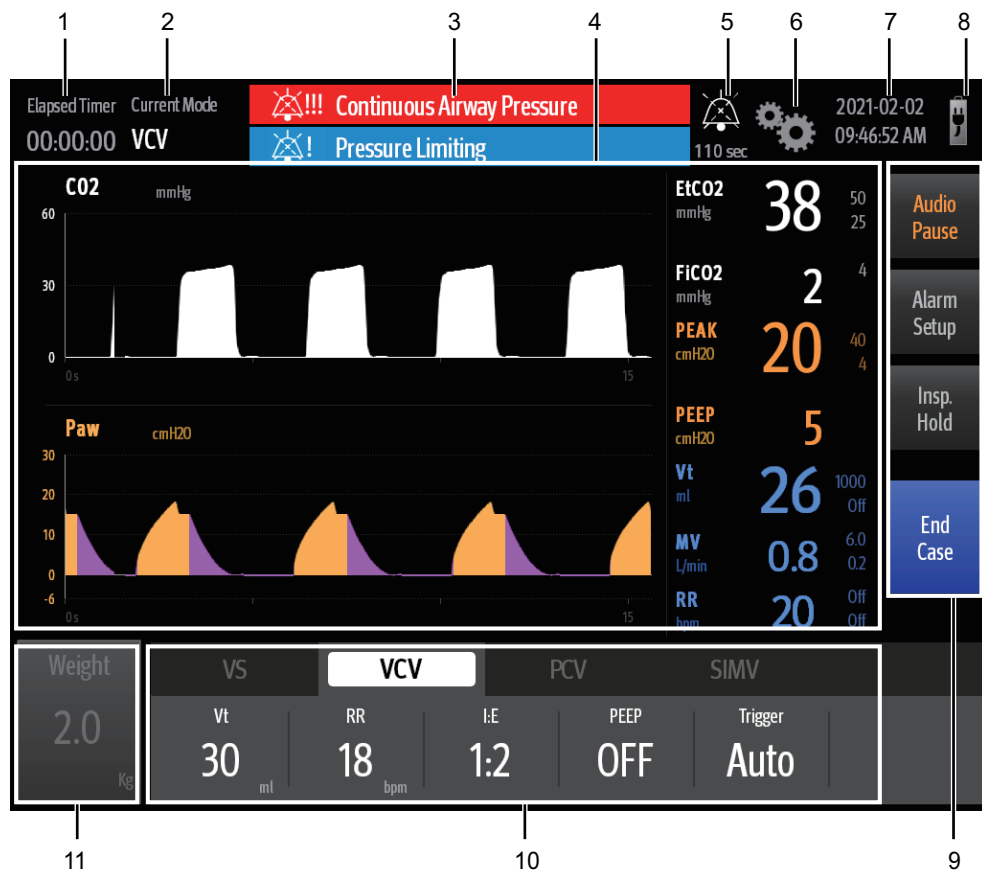
No.	Components	Description
1.	Basket	Used to store various medical equipments.
2.	Handrail	Used to move the machine. Its maximum bearable force is 100 N. NOTE: The handrail should not be used to lift the machine.
3.	Hanger	Used to hang gas supply hoses and power cords. NOTE: Hang the cables on the hanger when moving the machine so as to prevent unexpected tilting.

No.	Components	Description
4.	Ventilating fan outlet	Used to cool the electronic devices and prevent the accumulation oxygen concentrations. Do not block the ventilating fan outlet.
5.	Network interface (CS)	Supports connection to a PC for software upgrading.
6.	USB interface (SB)	Used to connect to a USB device so as to export data and upgrade software.
7.	Communication interface (SP)	Multi-functional communication port which supports data transmission with the weigher.
8.	Blower gas inlet	Blower gas Inlet.
9.	Power socket	Used to connect the power cord.
10.	Waste gas scavenging outlet	Used to connect AGSS or the anesthesia gas filter canister.
11.	Gas supply connector	Oxygen and air supply connectors.
12.	Weigher	Monitors the anesthesia gas filter canister in real time. When the weight increased surpasses the setting value of reminding, replace the gas filter canister. The cable of weigher should be connected to the multifunctional communication port (SP) to transfer data to the system.
13.	Caster	The casters are used to move the machine, and the brakes to fix it.



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3 System Interface and Basic Settings


3.1 System Interface



No.	System Interface	Description
1.	Elapsed timer	Displays the timekeeping information. Select to start, stop or reset the timer.
2.	Current ventilation mode	Displays the current ventilation mode.
3.	Alarm message field	Displays current alarm messages, including physiological alarms, technical alarms and prompt messages.
4.	Waveforms/parameter display field	Displays waveforms and monitoring parameters.

No.	System Interface	Description
5.	Alarm audio pause field	When the 120s alarm audio pause countdown icon  is displayed, it indicates that an alarm is generated and the alarm sound has been paused.
6.	Setup	Select  to open the [Main] menu.
7.	System time	Displays the current system time.
8.	Power status icon	Displays the current power supply status of the system.
9.	Soft key field	Displays the soft keys such as audio pause, alarm setup, inspiration hold, and end /start case.
10.	Ventilation mode and parameter setup field	Displays the keys for ventilation mode setup and corresponding parameters.
11.	Weight	The weight of the animal can be set in standby status and displayed in non-standby status.

3.2 Basic Settings

Select  button to enter the **[Main]** menu.

3.2.1 General

In this menu, it is allowed to set the following items.

Setting Items	Description
Vt/Weight	Tidal volume is associated with weight. Set the tidal volume value corresponding to per unit of the weight.
CO ₂ Scale	Select the scale of the CO ₂ waveform.
Built-in CO ₂ Module Switch	Set whether to turn on or off the CO ₂ module of the Anesthesia Machine. When the monitor is connected to the anesthesia machine successfully and [Built-in CO₂ module Switch] is disabled, CO ₂ data comes from the monitor; When [Built-in CO₂ module switch] is enabled, CO ₂ data comes from the anesthesia machine.
Screen Brightness	Adjust the screen brightness from 0 to 10.
Key Click Volume	Adjust the key click volume from 0 to 10.
History	View the list of trends and the event log. The system can display 48 hours of data of trends continuously. Event logs will not be cleared after the Anesthesia Machine powers off. The system can store up to 1,000 events. After the number of events exceeds 1,000, the earliest event will be overwritten by the latest event.


3.2.2 Weigher

The main function of the weigher is monitoring the weight of the anesthesia gas filter canister in real time. When the weight increased surpasses the setting value of reminding, replace the gas filter canister by the following procedure:

1. Place a new anesthesia gas filter canister.
2. Connect the waste gas scavenging pipeline as per the prompts on the screen.
3. Enter the **[Weigher]** menu to zero the weigher.
4. Set weight increase value for replacement remind.

3.2.3 Export Data

To export the system data during the use of the Anesthesia Machine, follow this procedure:

1. Insert a USB flash disk to the USB interface of the Anesthesia Machine as per the prompts on the screen.
2. In standby status, select  button → **[Export Data]** → **[Export]**.

The system data will export to the USB flash disk. The system data includes machine ID, monitoring data, system information, historical data and network information.


3.3 System Settings

NOTE:

- The [System] interface is accessible only in standby status.

The [System] interface is accessible only by authorized administrative service personnel with password access.

3.3.1 Setup

Select  button → **[System]** → input the default password “1234” to enter the system setting screen. Detailed introduction are as follows.

Setting Items	Description
Language/Unit	Set language, pressure unit, CO ₂ unit and weight unit.
Altitude	Set the altitude based on the local altitude. The ventilator will be adjusted according to the setting altitude to ensure the accuracy of output tidal volume.
Time/Date	Set the date, date format, time and time zone, etc.
Profiles	<p>Save the current profiles as the user configurations.</p> <ul style="list-style-type: none"> • When the anesthesia machine restarts within 60 seconds after an abnormal power outage, the system can automatically restore the recent profile. • If the power outage lasts longer than 120 seconds, the system will automatically load the user profile before the shutdown. • If the power outage lasts between 60 to 120 seconds, the system may automatically restore the recent profile or automatically load the user profile before the shutdown.

Setting Items	Description
Weigher	Switch the weigher on or off. When the weigher is off, the weigher will not be displayed on the [Main] screen, and its related alarms and prompt information will be closed.
Change Password	Change the system password as needed. After the system is installed, the authorized administrator should change the default password immediately to prevent unauthorized access to the [System] menu. The password may contain up to 30 digits including numbers, letters (case sensitive) and characters.
Network Settings	Set the network information. The operator can choose to obtain the network information automatically or input the network information manually.
Monitor Device Connection	Displays the device name and IP address of the monitoring devices recognized by the anesthesia machine. The operator can choose a monitor to be connected to the anesthesia machine.


3.3.2 Calibration

Zeroing Sensors

CAUTION

Before zeroing, turn off all the flowmeters, and disconnect the machine with breathing tubes of the animal end to main open circuit to atmosphere.

When there is a measurement deviation caused by an offset, zero the pressure and sensors by the following procedure:

1. Turn off all the flowmeters, and disconnect the machine with breathing tubes of the animal end.
2. Select  button → **[System]** → input the default password “1234” to enter the system setting screen.
3. Select **[Calibrate]** → **[Zero Sensors]** → **[Begin]** to perform pressure and flow zeroing.

After zeroing, the screen will show up “Zeroing Successful”.

Calibrating the CO₂ Module

When the measured value has a great deviation, perform the CO₂ module calibration by the following procedure:

1. Select **[Calibrate]** → **[CO₂ Module]** to calibrate the CO₂ module when the CO₂ module works in full accuracy mode.
2. Connect the calibration cylinder to the sampling tube and then open the cylinder pressure relief valve.
3. Enter the concentration of the supplied gas.
4. Click **[Begin]** to start calibration.

3.3.3 Information

In this menu, the system displays machine ID, MAC address and function status. This information can only be viewed, not changed.

3.4 Service Settings

Only authorized maintenance personnel by the manufacturer have access to the **[Service]** interface. Please contact the Customer Service Department or sales representative for assistance for help.

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4 Preoperative Tests

4.1 Requirements of Preoperative Tests

NOTE:

Do not use the machine if a failure occurs. Please contact the Technical Support.

Preoperative tests on the anesthesia machine should be performed according to the test intervals listed below. Refer to special procedures or precautions in this manual.

Perform the preoperative tests listed below at these events:

- Before using the anesthesia machine on each animal:
 - System Check
 - Startup Selftest
 - Leak Tests
 - Power Failure Alarm Tests
 - Pipeline Tests
 - Basic Ventilation Tests
 - Breathing System Tests
 - Alarm Tests
 - Inspect the AGSS
 - Inspect the Anesthesia Gas Filter Canister
 - Pre-operation Preparations
 - Vaporizer Tests
- After the service or maintenance of the anesthesia machine:
 - System Checks
 - Startup Selftest
 - Pipeline Tests
 - Breathing System Tests
 - Inspect the AGSS
 - Pre-operation Preparations

4.2 Preoperative Checklist

 **WARNING**

To ensure the normal operation of the machine and the safety of both the user and the animal, please follow all check procedures established by the hospital before administering anesthesia to the animal.

- Each day before administering anesthesia machine, the following should be done:
 - a. Connect the anesthesia machine to an AC power supply, turn on the power switch and verify that the system is powered by the AC power supply. Perform the System Check and Leak Test by following the instructions on the screen.
 - b. Check that the vaporizers are properly installed and sufficiently filled and that filler ports are tightly closed.
 - c. For the anesthesia gas filter canister, check if its gaining weight surpasses the claimed range. For an anesthesia machine equipped with an AGSS, check if the AGSS float position is between the Min and Max scale lines.
- Prior to administering anesthesia machine to each animal, the following should be done:
 - a. Check for any damage to or dangerous conditions in the equipment; ensure all necessary equipment and supplies are present, e.g., anesthetic drugs, CO₂ absorbent (not exhausted) and anesthesia gas filter canister (not overweighted).
 - b. Check that the central supply O₂ and Air pressure is within the specified range for pipelined gas supply (i.e., 280-600 kPa/40-87psi). Or, check the oxygen generator works well when using the oxygen generator and ensure that its maximum output pressure does not surpass 600 kPa.
 - c. With a breathing circuit and manual bag attached, check the operation of unidirectional valves by visual inspection.
 - d. Check the ventilation capability in Standby, Manual, VCV and VS modes.
 - e. Verify the monitoring functionality and check alarms.
- Prior to administering anesthesia machine to each animal, the following should be done:
 - Leak Test.

4.3 System Checks

Check the system to meet the following requirements:

1. The equipment is correctly connected and in good condition.
2. Inspect the system for:
 - a. Damage to flowmeters, vaporizers, gauges, supply hoses.
 - b. Complete breathing system with adequate CO₂ absorbent.
3. Inspect other items:
 - a. Flow control valve is closed.
 - b. Vaporizer is closed.
 - c. Vaporizer is dosed.
4. All components are correctly attached.
5. The breathing system is correctly connected and the breathing tubes are undamaged.
6. The gas supply system has been connected and the pressures are correct.
7. The necessary emergency equipment is available and in good condition.
8. Inspect the color of the soda lime in the canister. Replace the soda lime immediately if obvious color change is detected.

9. Applicable anesthetic and emergency drugs are available.
10. The casters are not damaged or loose, the brake(s) is set and prevents movement.
11. Ensure the breathing system is in proper position.
12. The AC mains indicator is displayed when the power cord is connected to the AC power source. If the indicator is not displayed, the system does not have electrical power.
13. The anesthesia machine can be switched on or off normally.
14. Check if the O₂ flush button is normal.

4.4 Startup Selftest


Perform the following procedure:

1. When the system is turned on, it performs a self-test to ensure its alarm system (speaker) and hardware boards are properly functioning.
2. After the startup, the machine automatically enters the **[System Check]** screen. If failed, the failed items will show up on the screen.
3. Continue to operate or troubleshoot the equipment based on the selftest results.

4.5 Leak Tests

4.5.1 Auto Circuit Leak Test

NOTE:

- The [Event Log] of the system records the result of the last automatic circuit leak test, including the passed, failed, or skipped recordings. If needed, select  button to enter the [Main] screen and click [History] → [Event log].
 - During the test, please replace the HEPA if the [Replace HEPA Filter] alarm prompts.
 - The system will perform the compliance test while doing the auto circuit leak test. The compliance means the overall compliance of the breathing system (including bellows, CO₂ absorbent canister and breathing tubes).
-

1. Start the test.
 - From system being turned on: when the system is turned on, it will initiate selftest and enter the **[Manual Circuit Leak Test]** screen.
 - From the standby screen: select **[Leak Test]** and enter **[Auto Circuit Leak Test]** screen.
2. Perform operations according to the instructions on the screen.

4.5.2 Manual Circuit Leak Test



Perform the following procedure:

1. Start the test.

- From system being turned on: when the system is turned on, it will initiate self-test and enter the [**Manual Circuit Leak Test**] screen.
 - From the standby screen: select [**Leak Test**] and enter [**Auto Circuit Leak Test**] screen.
2. Perform operations according to the instructions on the screen.

4.6 Power Failure Alarm Tests

Perform the following procedure:

1. Press  to turn on the system.
2. Cut off the AC power.
3. Ensure that the AC power indicator is off and the system prompts [**Battery in use**].
4. Reconnect the AC power.
5. Ensure that the AC power indicator is on and [**Battery in use**] disappears.
6. Press  to turn off the system.

4.7 Pipeline Tests

Perform the following procedure:

1. Connect the gas supply with the gas supply connector of the anesthesia machine. Then, turn on the system.
2. Adjust the flow to a medium level of the measurement range.
3. Ensure that the readings of each pipeline pressure gauge are within the range of 280 to 600 kPa. Please note that the readings of the pressure gauge should be in line with the output pressure of the oxygen generator.
4. Cut off the gas supply of the pipeline.
5. Ensure that the gauge of related gas supply pressure decreases to zero.

4.8 Basic Ventilation Tests

Perform the following procedure:

1. Install the breathing circuit and manual bag.
2. Connect the test lung or manual bag to the animal end of the Y-piece of the breathing circuit.
3. Set the O₂ flow to 1 L/min.
4. Set the anesthesia machine controls according to the following table:

- Select [VS] and begin ventilation.

Parameters	Settings
Ventilation Modes	VS
Vt	20 mL
Min RR	8 bpm
PEEP	OFF
Trigger	Auto

- Verify that the manual bag at the animal end of the Y-piece of the breathing circuit inflates and deflates and that the monitoring value of Vt on the display is consistent with the setting value of Vt.

4.9 Breathing System Tests

WARNING

- **Objects in system can stop gas flow to the animal. This can cause injury or death. Ensure that there are no test plugs or other objects in the breathing system.**
- **Do not use a test plug that is small enough to fall into the breathing system.**

4.9.1 Test for Inspiratory Check Valve and Expiratory Check Valve

Perform the following procedure:

- Connect the Y-piece breathing circuit to the breathing system.
- Connect the reservoir bag to the reservoir bag connector and the animal end of the Y-piece breathing circuit respectively.
- Turn the APL valve control knob to adjust the pressure to 70 cmH₂O.
- Hold down the O₂ flush button to fill the reservoir bag.
- Press the reservoir bag and check the valves in the breathing system are operating normally.
 - Inspiratory check valve: if the inspiratory check valve opens during inspiration and closes at the start of expiration, then the inspiratory check valve is operating normally.
 - Expiratory check valve: if the expiratory check valve opens during expiration and closes at the start of inspiration, then the expiratory check valve is operating normally.

4.9.2 Bellows Tests

Perform the following procedure:

- Set the system to Standby status.
- Move the Manual/Auto switch to the Auto position.
- Set all gas flows to a minimum volume.

4. Insert the Y-piece tube to the leak test plug so as to block the outlet of the Y-piece tube.
5. Press the O₂ flush button to raise the bellows to its top.
6. Ensure that the airway pressure cannot rise over 15 cmH₂O.
7. The large bellows should not drop more than 300 ml in a minute, or the small bellows should not drop more than 100 ml in a minute. Otherwise, it means the bellows is leaky. Please reinstall it.

4.9.3 APL Valve Tests

Perform the following procedure:

1. Ensure that the system is in Standby status. If not, select the **[Standby]** button on the main screen and follow the on-screen prompts to enter Standby mode.
2. Set the Manual/Auto switch to the Manual position.
3. Connect the manual bag connector.
4. Connect the Y-piece on the breathing circuit to the leak test port.
5. Turn the APL valve control knob to adjust the APL valve to 30 cmH₂O.
6. Set the O₂ flow to 3 L/min. Ensure that value displayed on the airway pressure gauge ranges from 20 to 40 cmH₂O.
7. Pull the APL valve and observe the reading on the airway pressure gauge to verify that the pressure can reach to 50-70 cmH₂O.
8. Adjust the APL valve to the MIN position. Ensure that the value displayed on the airway pressure gauge does not exceed 5 cmH₂O.
9. Set the O₂ flow to a minimum value. Ensure that the value displayed on the airway pressure gauge does not decrease below 0.

4.10 Alarm Tests

The system will perform selftest after startup. The startup interface will be displayed after a beep. The system will enter the leak test screen in half a minute. It indicates that the audible alarm indicator starts working.

Preparations before the Alarm Tests

1. Connect the test lung or manual bag to the Y-piece of the breathing circuit.
2. Move the Auto/Manual Switch to the Auto position.
3. Power on the system. Set the system to Standby status.
4. Set the anesthesia machine controls as follows:
 - Ventilation mode: [VCV].
 - Vt: 50 ml.
 - RR: 20 bpm.

- I:E: 1:2.
 - PEEP: OFF.
 - Trigger: Auto.
5. Press the O₂ flush button to lift the bellows to its top.
 6. Rotate the O₂ flow knob to set the flow to 0.5-1 L/min.
 7. Press **[Start Case]** button to start working status.
 8. Ensure that:
 - Monitoring parameters of ventilator is normal.
 - The bellows can drop or rise regularly during mechanical ventilation.

4.10.1 Continuous Airway Pressure Too High Alarm Test

Perform the following procedure:

1. Connect the manual bag connector to its connector.
2. Set the O₂ flow to its minimum position.
3. Turn the APL valve control knob to adjust the APL valve to 30 cmH₂O.
4. Set the Auto/Manual switch to Manual position.
5. Push the O₂ flush button for about 15 seconds, and ensure that the screen prompts **[Continuous Airway Pressure]** alarm.
6. Disconnect the breathing circuit and ensure that the **[Continuous Airway Pressure]** alarm disappears.

4.10.2 Paw Too High/Too Low Alarm Test

Perform the following procedure:

1. Set the Auto/Manual switch to Auto position.
2. Select **[Alarm Setup]** to enter the **[Alarm Limit]** screen.
3. Set Paw low limit to 10 cmH₂O and Paw high limit to 20 cmH₂O.
4. Set the Paw to 25 cmH₂O in a ventilation mode, and ensure that the **[Paw Too High]** alarm appears.
5. Set the Paw to 5 cmH₂O in a ventilation mode, and ensure that the **[Paw Too High]** alarm disappears and **[Paw Too Low]** alarm appears.
6. Set the Paw to 15 cmH₂O in a ventilation mode, and ensure that the **[Paw Too Low]** alarm disappears.

4.10.3 Vt Too High/Too Low Alarm Test

Perform the following procedure:

1. Set the Auto/Manual switch to Auto position.

2. Select **[Alarm Setup]** to enter the **[Alarm Limit]** screen.
3. Set Vt high limit to 40 cmH₂O and Vt low limit to 20 cmH₂O.
4. Connect the test lung with the Y-piece. Set Vt to 50 ml in VCV mode and ensure that the **[Vt Too High]** alarm appears.
5. Set Vt to 5 ml and ensure that the **[Vt Too High]** alarm disappears and **[Vt Too Low]** alarm appears.
6. Set Vt to 30 ml and ensure that the **[Vt Too Low]** alarm disappears.

4.11 Inspect the AGSS

NOTE:

Do not block the AGSS pressure compensation openings during the inspection.

Open the waste gas disposal system and check if the float can surpass the MIN line. Please read the figures according to the float center. If the float is tacky or damaged, please reinstall or replace it based on the following possible conditions.

If the float fails to move up to above the MIN scale line, possible reasons include as follows:

1. The float surface is tacky. Turn over the AGSS and check if the float moves up and down freely.
2. The float is rising slowly. The filter may be blocked. Disconnect the EVAC port with the AGSS. Dismount the AGSS and its hose, together with its upper cover. Check the AGSS filter, and shake it above the waste container. Clean it if necessary. If it is a must to replace the filter, please follow local regulations to dispose of discarded filters.
3. The waste gas disposal system is not working, or the pump rate is less than the flow required for proper operating of the AGSS.

4.12 Pre-operation Preparations

Perform the following procedure:

1. Ensure that the anesthesia machine parameters and alarm limits are set to applicable clinical levels.
2. Ensure that the system is in Standby status.
3. Ensure that the equipment for airway pressure maintenance, manual ventilation and tracheal intubation, and applicable anesthetic and emergency drugs are available.
4. Set the ventilation switch to the Manual position.
5. Connect the manual bag to its connector.
6. Turn off the vaporizer.
7. Turn the APL valve control to the MIN position to fully open the APL valve.

8. Ensure that the breathing system is correctly connected and not damaged.



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5 Operation

5.1 Turn on the System

NOTE:

The system checks whether alarm tones function properly during the start-up. If normal, the speaker can produce self-test sound. Otherwise, do not use the equipment and contact the Technical Support immediately.

1. Insert the power cord into the power socket. Ensure that the external power indicator is on.
2. Press  button and  is lit up.
3. The screen displays the start-up screen and then the system conducts a self check of the speaker once.
4. The screen displays the selftest progress bar, and then the system check screen is displayed.
5. Completes the leak test.

5.2 Enter Standby Mode

 **WARNING**

Entering Standby mode will stop ventilation and parameter monitoring. Do not select Standby mode if the animal requires continuous ventilation.

Select the [Standby] key and enter the Standby interface after confirmation.

5.3 Set Gas Inputs

1. Connect the gas supply and ensure there is enough pressure for gas supply.
2. Adjust the flows of gas by rotating the knob.


Their values are displayed on the flowmeter.

5.4 Set Animal Weight

NOTE:

The weight value can be set only in Standby mode and it cannot be changed during ventilation.

The Anesthesia Machine provides linkage between weight and tidal volume, that is, the tidal volume value can be set through weight setting. The procedure is as follows:

1. Select  → [Main] → [Vt/Weight].
2. Set the appropriate [Vt/Weight].
3. Enter Standby mode and select Weight on the main screen.
4. Set the appropriate weight value.

5.5 Install and Set the Vaporizer

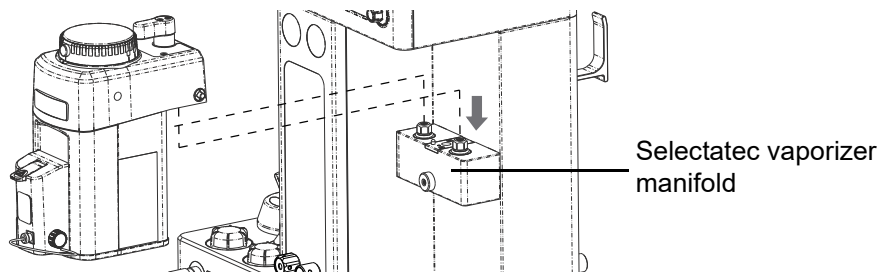
5.5.1 Install the Vaporizer

NOTE:

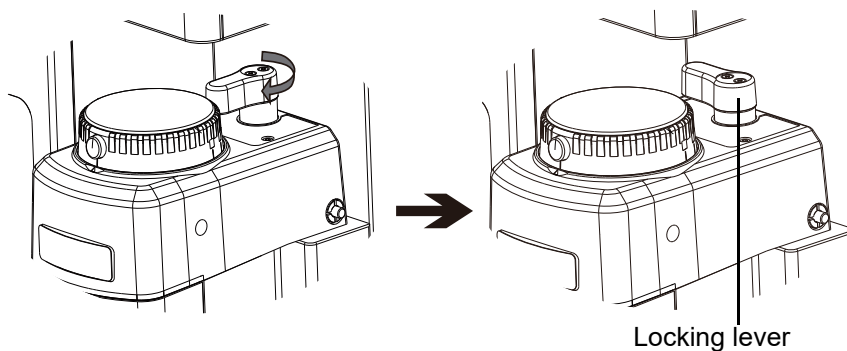
- This section applies only to anesthesia machines with Selectatec vaporizer manifold.
 - If the vaporizer is incompatible with the Anesthesia Machine, the performance of the anesthetic agent in the vaporizer will be degraded. Use the vaporizer matching the Anesthesia Machine.
 - Use vaporizers compliant to ISO 80601-2-13.
-

Perform the following procedure:

1. Mount the vaporizer onto the Selectatec vaporizer manifold.



2. Push down and turn the locking lever to the position shown in below right figure, so as to lock the vaporizer in horizontal position.



3. If top of the vaporizer is not horizontal, remove the vaporizer and reinstall it. In case of reinstalling the vaporizer, try to lift each vaporizer straight up off the manifold rather than tilting. Do not rotate the vaporizer on the manifold.

5.5.2 Set the Vaporizer

WARNING

- **The barometric pressure may differ from the calibration pressure of the anesthetic vaporizer. This may cause an inaccurate output of the anesthetic agent. The operator should continuously monitor the concentration of anesthetic agent during system use to determine if the output concentration is accurate.**
 - **Jerky movements or tilting at an angle of more than 30° can cause incorrect output concentration.**
 - **If the vaporizer is not going to be used for up to six months, then the anesthetic agent inside the vaporizer should be drained.**
-

Perform the following procedure:

1. Check the liquid level of the vaporizer. If the liquid level is below the min warning line, it needs to add anesthetic agent.
2. Press the control dial of the vaporizer to set the concentration of anesthetic agent to a proper value.

5.5.3 Fill the Anesthetic Agent

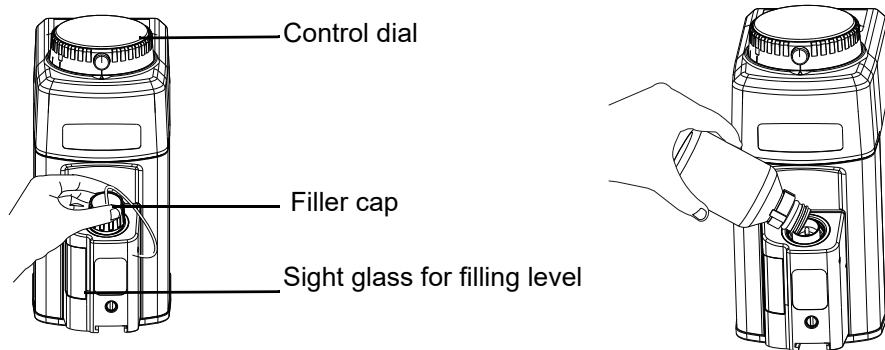
WARNING

- **Only fill the vaporizer with the anesthetic agent specified on it. Before use, check the name of anesthetic agent and color mark on the vaporizer and the anesthetic agent bottle. Sevoflurane is yellow while Isoflurane is purple.**
 - **Stop using the vaporizer immediately which has been filled or partly filled with the wrong anesthetic agent or other substance to prevent danger to health. If this occurs, mark the vaporizer for incorrect filling and call the distributor for servicing.**
-

After filling for the first time, wait 15 minutes for the dry wicks inside to become saturated. Check the following items before filling the anesthetic agent:

- Check the vaporizer for damage.
- Set the control dial to “0” (off) position.
- Observe expiry date of the anesthetic agent.

Pour Fill System



1. Set the control dial to “0” (off) position.
2. Rotate the filler cap slowly anticlockwise to discharge the pressure in the vaporizer.
3. Remove the cap of the anesthetic bottle, and pour the anesthetic agent into the vaporizer slowly.
4. Check the filling level on the sight glass during filling. The filling level must not exceed the maximum mark, or there is a risk of incorrect output concentration. If the maximum mark has been exceeded, the agent will flow out. Please drain the excess liquid until the level drops below the maximum mark.
5. Tighten the filler cap clockwise. If this is not done properly, fresh gas and anesthetic agent may escape when the vaporizer is switched on next time.

⚠ WARNING

Significant quantities of anesthetic agent vapor may escape if the control dial does not return to “0” position.

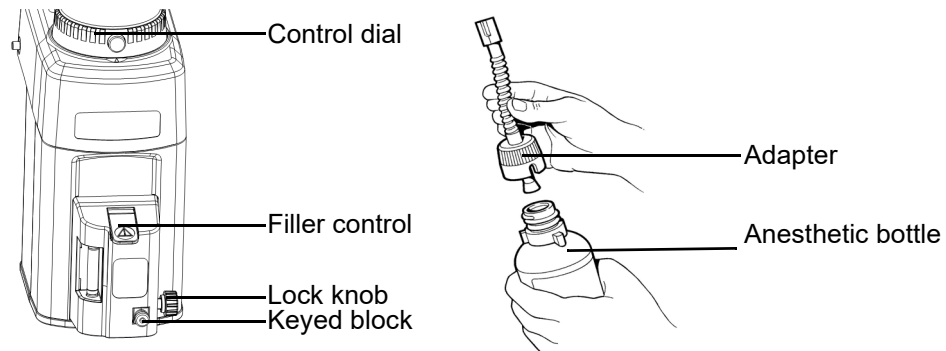
⚠ CAUTION

It is necessary to wait at least 5 seconds after setting the control dial to “0” position before opening the vaporizer. This allows the pressure to balance and prevents fresh gas and anesthetic agent vapor escaping from the vaporizer.

Key Filler System

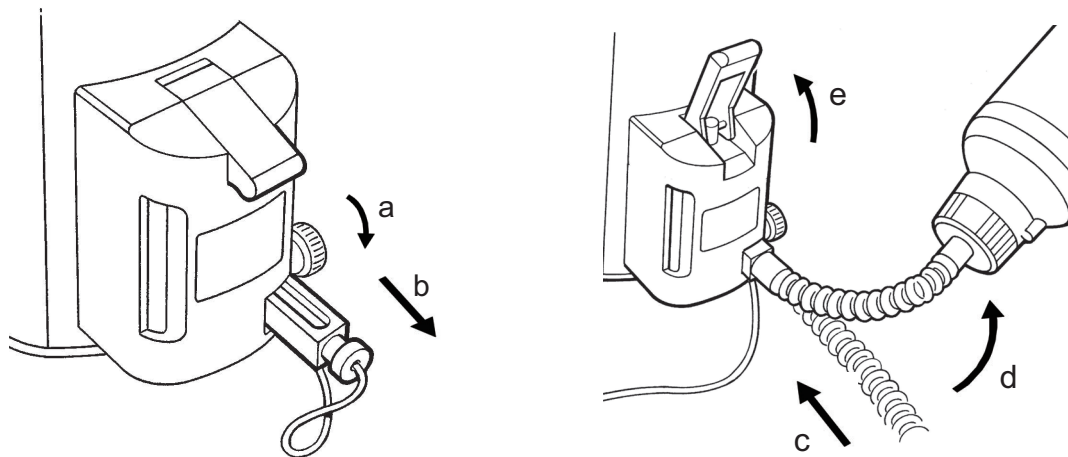
Perform the following procedure:

1. Set the control dial to “0” (off) position.
2. Attach the Keyed Filler adapter to the bottle. Tighten the adapter to ensure an airtight joint, which must be maintained throughout the filling operation.



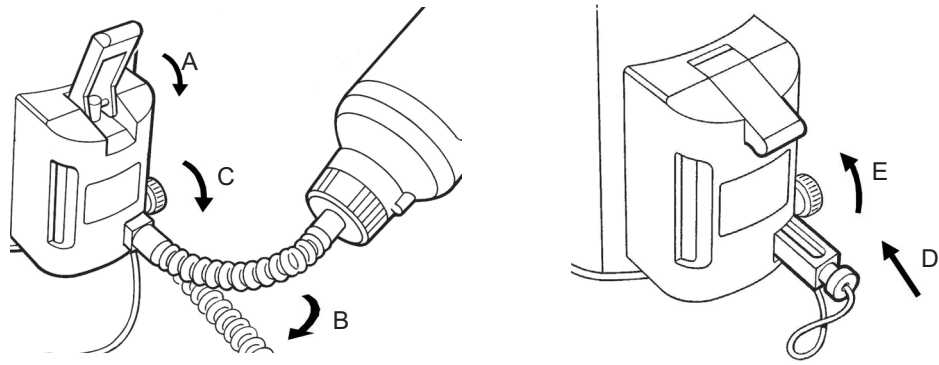
3. Fill the anesthetic agent.

- a. Loosen the knob.
- b. Pull the keyed block out.
- c. Insert the keyed end of the bottle adapter fully into the vaporizer receiver. Tighten the lock knob to secure the adapter.
- d. Raise the bottle above the filler.
- e. Open the filler control and allow the liquid to flow into the vaporizer until the upper mark is reached on the filler block window.



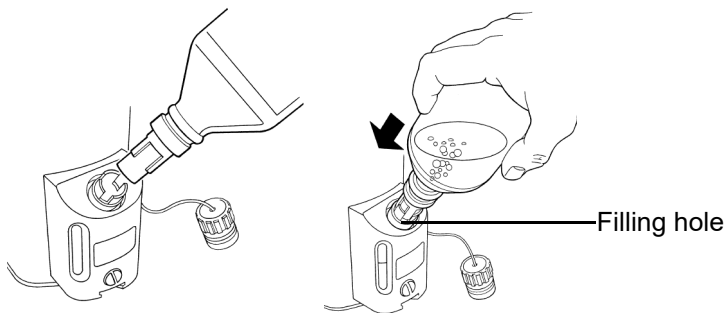
4. Perform the following procedure after filling.

- a. Lower the filler control.
- b. Lower the bottle below the level of the filler and allow the liquid in the bottle adapter to flow back into the bottle.
- c. Loosen the lock knob, and remove the bottle adapter from the receiver.
- d. Reinstall the keyed block and tighten the knob.



⚠ CAUTION

If the connection between the filling adapter and the anesthetic agent bottle is not tight, the anesthetic agent may escape.

Quik-Fil System


1. Set the control dial to "0" (off) position.
2. Remove the protective cap from the anesthetic agent bottle, checking that the bottle and filler mechanism are not damaged.
3. Remove the vaporizer filler block cap and insert the bottle nozzle into the filler block. Rotate the bottle to align the bottle filler keys with the slots in the filler block.
4. Note the liquid level in the vaporizer window and press the agent bottle firmly into the vaporizer filler against the spring valve assembly. Allow the liquid to flow into the vaporizer until the maximum level mark is reached, paying continuous attention to the level in the window and the air return bubbles flowing into the bottle.
5. Release the bottle when the vaporizer is full and the continuous stream of bubbles ceases.
6. Pull out the bottle from the vaporizer filler. Replace the vaporizer filler block cap and the protective cap on the agent bottle.

NOTE:

The highest liquid level of the anesthesia agent is 250 mL and the lowest of it is 35 mL.

5.5.4 Drain the Anesthetic Agent

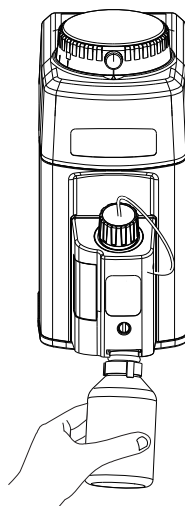
⚠ WARNING

- **Handle, Storage, or dispose of the drained anesthetic as drug. Otherwise, anesthetic agent may be misused.**
 - **When the drainage is completed, please tighten the filler cap and drainage knob; otherwise, the anesthetic agent may escape when the vaporizer is turned on next time.**
-

NOTE:

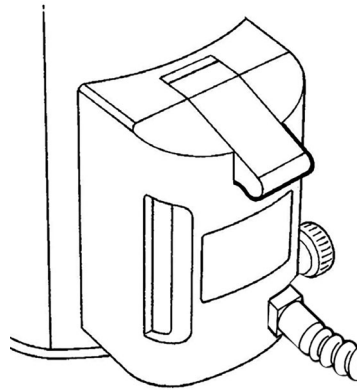
- Do not reuse anesthetic agent drained from the vaporizer.
 - During drainage, do not make an anesthetic bottle full; otherwise, anesthetic agent overflow may occur.
-

Pour Fill System



1. Set the control dial to “0” (off) position.
2. Select the correct bottle and place it under the drainage outlet.
3. Slowly rotate the filler cap counterclockwise.
4. Drain the anesthetic agent until no anesthetic agent is visible in the window and no anesthetic agent flows into the bottle.
5. If necessary, turn off the drainage knob and drain the anesthetic agent into another anesthetic bottle.
6. When the vaporizer has been completely drained, close the drainage knob clockwise. Tighten the cap of the anesthetic agent bottle even if it is completely empty. Additionally, tighten the filler cap.

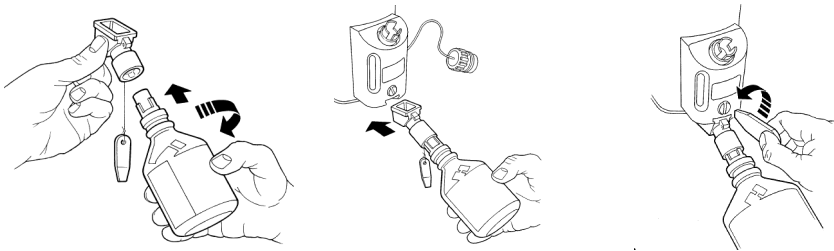
Key Filler System



Perform the following procedure:

1. Set the control dial to “0”(off) position.
2. Repeat steps of the section of “Key Filler System”. Put the anesthetic agent bottle under the vaporizer.
3. Open the filler control and allow the liquid of the adapter flow back to the bottle.
4. Close the filler control.
5. Loosen the knob and pull the keyed block out. Reinstall the keyed block and tighten the knob.

Quik-Fil System



Perform the following procedure:

1. Remove the protective cap from an empty bottle. Insert the bottle nozzle into the drain funnel. Rotate the bottle to align the bottle filler keys with the index slots in the drain funnel, and screw the drain funnel onto the empty bottle.
2. Remove the vaporizer filler block cap.
3. Fully insert the drain funnel into the keyed drain slot, and unscrew the drain plug. Continue to drain the vaporizer until empty. Tighten the drain plug, and pull out the drain funnel.
4. Unscrew the drain funnel from the bottle and refit the bottle cap and the vaporizer filler block cap.

5.6 Set the Ventilation Mode

5.6.1 Volume Support Ventilation (VS)

Description of the VS Mode

VS mode means that the system will start volume support ventilation upon detection of animal's inspiration effort that reaches the preset inspiratory trigger level (pressure or/and flow) to provide preset volume to the animal.

In this mode, the duration of inspiratory and expiratory phase are controlled by the animal itself. The system starts automatic ventilation when it detects that the period of time in which the animal does not perform continuous effective inspiratory trigger exceeds the preset minimum respiratory rate.


The first VS delivered is an experimental ventilation mode that delivers a breath according to the default pressure level. Then, this pressure level will be used as a regulating object for tidal volume control in the following ventilation cycles.

Starting the VS Mode

NOTE:

After switching to a new automatic ventilation mode, ensure that all related parameters are set appropriately.

To start the VS mode, follow this procedure:

1. Select [VS] on the main screen.
2. Check that all the VS parameters are set appropriately.
3. If necessary, rotate the control knob to set parameters, and press the control knob to confirm the current parameter setting.
4. Select  to confirm the all parameter settings.
5. Select [Start Case].

Ventilation Parameter in the VS Mode

When the VS mode is enabled, the system will display the following parameters:

Parameters	Description
Vt	The gas volume that the animal inspires or expires each time during resting breathing.
MinRR	The mechanically controlled breaths will be triggered when the inspiratory time surpasses the breathing cycle time of minimum respiratory rate.
PEEP	Positive end expiratory pressure.
Trigger	Auto trigger.

5.6.2 Target Adaptive Volume Support (TAVS, “VS+” for Short)

Description of the VS+ Mode

In VS+ mode, the EtCO₂ alarm limits are used as the target adjustment range. When the monitored EtCO₂ exceeds the target range, the system will adjust the respiration rate and tidal volume to keep the monitored EtCO₂ within the target range.

VS+ mode means that the system will start target adaptive volume support ventilation upon detection of animal's inspiration effort that reaches the system's built-in inspiratory trigger level (pressure or/and flow) . The system triggers target adaptive volume support ventilation when it detects that continuously insufficient inspiratory effort for a time period exceeds the period of the minimum respiration rate. In this mode, the duration of inspiratory and expiratory phase are controlled by the animal itself.

NOTE:

VS+ mode is available only when the machine is equipped with the CO₂ module or supports CO₂ communication.

Starting the VS+ Mode

CAUTION

Before starting the VS+ mode, check the anesthetic depth and animal condition. Do not use the VS+ mode when the anesthesia is too deep.


NOTE:

- The system will automatically adjust the ventilation parameters in the VS+ mode. Pay attention to anesthetic depth and animal condition.
 - The system will maintain ventilation with the preset ventilation parameters in the VS+ mode when the screen prompts the following technical alarms: CO₂ Module Error, CO₂ Module High Temp, CO₂ Sampleline Occluded, CO₂ No Watertrap, EtCO₂ Over Range, FiCO₂ Over Range, CO₂ Zero Failed, CO₂ Change Watertrap, CO₂ Self Test Error, FiCO₂ Too High, Flow Sensor Failure, Pressure Monitoring Channel Failure, CO₂ Hardware Error and CO₂ Init Error. The system will restore the automatic adjustment function in the VS+ mode only after all the technical alarms are cleared.
 - The CO₂ low dead space adapter is recommended for an animal less than 3 kg.
 - After switching to a new mechanical ventilation mode, ensure that all relevant ventilation parameters are set appropriately.
-

To start the VS+ mode, follow this procedure:

1. Select [VS+] on the main screen.
2. Check that all the VS+ parameters are set appropriately.

If necessary, rotate the control knob to set parameters according to the animal's condition, and press the control knob to confirm the current parameter setting.

3. Select  to confirm all parameter settings.

4. Select [Start Case].

Ventilation Parameter in the VS+ Mode

When the VS+ mode is enabled, the system will display the following parameters:

Parameters	Description
VtRef	Initial value of the target tidal volume when switching to VS+ mode, the actual target tidal volume will be adjusted based on this value.
MinRR	The mechanically controlled breaths will be triggered when the inspiratory time surpasses the breathing cycle time of minimum respiratory rate.
MaxRR	The mechanically controlled respiratory rate does not exceed the maximum respiratory rate.
PEEP	Positive end expiratory pressure.

5.6.3 Volume Control Ventilation (VCV)

Description of the VCV Mode

VCV is a volume targeted control ventilation mode with pressure-regulated manner.

In the VCV mode, each time automatic ventilation starts, gas is delivered to the animal at a decreasing flow. It implements volume control ventilation in a pressure-regulated manner. In VCV, a relatively low pressure level is held as much as possible during the inspiratory phase, and the gas volume delivered is guaranteed to be equal to the preset tidal volume. Pressure control level will vary according to the tidal volume setting, resistance and compliance of the animal's lungs. The adjustment of pressure increase of the machine is limited, and the maximum pressure cannot exceed the pressure alarm high limit -5 cmH₂O.

In the VCV mode, you can set PEEP to improve expiration of end-tidal carbon dioxide and to increase oxygenation of breathing process. The first VCV delivered is an experimental ventilation mode that delivers a breath according to the default pressure level. Then, this pressure level will be used as a regulating object for tidal volume control in the following ventilation cycles.

In this mode, the system will deliver a breath when detecting the spontaneous breathing of the animal.


To ensure the set tidal volume gas delivery, the ventilator adjusts gas flow based on the measured inspiratory volume, dynamically compensates for the loss of tidal volume arising from breathing system compliance and system leakage, and compensates for the effect of fresh gas as well. This is called tidal volume compensation.

Starting the VCV Mode

NOTE:

After switching to a new automatic ventilation mode, ensure that all related parameters are set appropriately.

To start the VCV Mode, follow this procedure:

1. Select the [VCV] on the main screen.
2. Check that all the VCV parameters are set appropriately.
3. If necessary, rotate the control knob to set parameters, and press the control knob to confirm the current parameter setting.
4. Select  to confirm all parameter settings.
5. Select [Start Case].

Ventilation Parameter in the VCV Mode

When the VCV mode is enabled, the system will display the following parameters:

Parameters	Description
Vt	The gas volume that the animal inspires or expires each time during resting breathing.
RR	The respiratory rate monitored in one minute.
I:E	Ratio of inspiratory time to expiratory time.
PEEP	Positive end expiratory pressure.
Trigger	When the trigger level is detected, the ventilator starts to enter the inspiratory phase.

5.6.4 Pressure Control Ventilation (PCV)

Description of the PCV Mode

In the PCV mode, each time automatic ventilation starts, airway pressure rises rapidly to the preset pressure control level. Then, the closed-loop feedback system adjusts the gas supply rate to an appropriate range based on the setting value of pressure control level and the compliance and resistance of the animal. Then gas flow slows down through the feedback system to keep Paw constant until expiration starts at the end of inspiration. The tidal volume delivered in the PCV mode changes based on the pulmonary compliance and airway resistance of different animals.

In this mode, the system will deliver a breath when detecting the spontaneous breathing of the animal.

In this mode, you can set PEEP to improve expiration of end-tidal carbon dioxide and to increase oxygenation of breathing process, etc.


Starting the PCV Mode

NOTE:

After switching to a new automatic ventilation mode, ensure that all related parameters are set appropriately.

To start the PCV Mode, follow this procedure:

1. Select the [PCV] on the main screen.

2. Check that all the PCV parameters are set appropriately.
3. If necessary, rotate the control knob to set parameters, and press the control knob to confirm the current parameter setting.
4. Select  to confirm all parameter settings.
5. Select [Start Case].

Ventilation Parameter in the PCV Mode

When the PCV mode is enabled, the system will display the following parameters:

Parameters	Description
Pinsp	The inspiratory pressure in the pressure control mode is an absolute value relative to the PEEP.
RR	The respiratory rate monitored in one minute.
I:E	Ratio of inspiratory time to expiratory time.
PEEP	Positive end expiratory pressure.
Trigger	When the trigger level is detected, the ventilator starts to enter the inspiratory phase.

5.6.5 Synchronized Intermittent Mandatory Ventilation (SIMV)

Description of the SIMV Mode

SIMV mode delivers pressure regulated volume control ventilation to the animal at preset intervals. In the SIMV mode, the ventilator waits for the animal's next inspiration based on the specified time interval. The inspiratory trigger level can be divided into [F-trig], [P-Trig] and [Auto Trigger]. If Trigger is reached within the trigger waiting time (called synchronous trigger window), the ventilator delivers pressure controlled ventilation synchronously with the preset tidal volume and inspiratory time. If the animal does not inhale in the trigger window, the ventilator will deliver pressure regulated volume control ventilation to the animal at the end of the trigger window. Spontaneous breathing outside trigger window can acquire pressure support.

If the inspiratory trigger level is reached outside the trigger window, the ventilator will deliver pressure support ventilation at preset ΔP_{supp} .


Starting the SIMV Mode

NOTE:

After switching to a new automatic ventilation mode, ensure that all related parameters are set appropriately.

To start the SIMV mode, follow this procedure:

1. Select the [SIMV] on the main screen.
2. Check that all the SIMV parameters are set appropriately.

3. If necessary, rotate the control knob to set parameters, and press the control knob to confirm the current parameter setting.
4. Select  to confirm all parameter settings.
5. Select [Start Case].

Ventilation Parameter in the SIMV Mode

When SIMV mode is enabled, the system will display the following parameters:

Parameters	Description
Vt	The gas volume that the animal inspires or expires each time during resting breathing.
RR	The respiratory rate monitored in one minute.
T _{insp}	Inspiratory time in one breathing cycle.
PEEP	Positive end expiratory pressure.
ΔP _{supp}	A relative value of PEEP.
Trigger	When the trigger level is detected, the ventilator starts to enter the inspiratory phase.

5.6.6 Auxiliary Common Gas Outlet (ACGO) Mode

When ACGO is On, the system is in ACGO mode. If the current ventilation mode is VCV or other ventilation mode, and ACGO is enabled, the system will enter VCV mode automatically or other ventilation mode after the ACGO mode is Off without changing the ventilation mode.

5.6.7 Manual Ventilation

Manual ventilation mode is the operating mode used to manually ventilate the animal or allow the animal to breathe spontaneously. In this mode, APL valve is used to adjust the peak pressure of breathing system and gas volume of the manual bag. When the pressure in the breathing system reaches the preset limit of the APL valve, the valve will be opened to release the excessive gas.

To enable manual ventilation mode, follow this procedure:

1. Rotate the APL valve and adjust the pressure of the breathing system to an appropriate range.
2. Set the Auto/Manual switch to the Manual position.
3. Push the O₂ flush button to inflate the manual bag if necessary.

NOTE:

- Ensure that the manual ventilation mode can be used normally during operation.
 - If the mechanical ventilation is failed, the manual ventilation mode can be set for continuous ventilation.
-

5.7 Inspiratory Hold

CAUTION


Set the proper duration time according to the animal's respiratory condition.

NOTE:

The inspiration hold can only be used in mechanical ventilation modes, not in manual ventilation, ACGO and Standby modes.

Inspiration hold means to extend the animal's time of inspiratory phase manually and to prevent the animal from expiration for a certain period of time.

To start the inspiratory hold, follow this procedure:

1. Select **[Insp. Hold Start]** button.
2. Set the inspiratory hold parameter.
 - **[Min Delay Time]**: minimum delay time to start the inspiratory hold. The inspiratory delay time is related to the animal's inspiratory condition and may be greater than the set minimum delay time.
 - **[Duration Time]**: inspiratory phase hold time.
3. Select  to confirm all parameter settings.
 - When the preset inspiration duration is reached, the system automatically stops the inspiration operation.
 - If necessary, select **[Insp. Hold Stop]** to stop the inspiratory hold operation during the inspiratory hold process, .

5.8 Use CO₂ Data of the Monitor

NOTE:



- If the monitor is in the standby status, the monitor does not transmit CO₂ data to the anesthesia machine.
- If CO₂ data comes from the monitor, EtCO₂ data on the **[History]** screen and the exported EtCO₂ data are marked with “+”.

The anesthesia machine can be connected to the uMEC or ePM series monitor manufactured by Mindray Animal Medical through network and obtain CO₂ data from the uMEC or ePM series monitor.

Connected to the monitor through a network cable

Perform the following procedure:

1. Use a network cable to connect the network interface of the anesthesia machine and the monitor separately.
2. Set that the anesthesia machine and the monitor are on the same network segment manually.


- a. Set the network information of the monitor on the network setup screen. For detailed operations, see *Portable Multi-Parameter Veterinary Monitor Operator's Manual*.
 - b. In the standby status, select  button → **[System]** → input the default password “1234”.
 - c. On the **[Network Setup]** tab of the anesthesia machine, set that the IP address of the anesthesia machine and monitor are in the same network segment and the submask is the same.
 - d. Select  to confirm all parameter settings.
3. Perform the following procedure on the **[Monitor Device Connection]** tab of the anesthesia machine.
- a. Confirm the **[Device Name]** and **[Monitor Device IP Address]**, and select the desired monitoring device.
 - b. Select **[Connect]**.
A message **[Connected]** is displayed in the lower left corner of the **[Monitor Device Connection]** tab, indicating the connection is successful.

Connected to the monitor through the same LAN

Perform the following procedure:

1. Use 2 network cables to connect the anesthesia machine and the monitor to the same LAN.
2. Set the network information in the following two ways:
 - Obtain network information manually: On the network setup tab of the anesthesia machine and the monitor, select **[Obtain Network Info Automatically]**. For detailed operations of the monitor, see *Portable Multi-Parameter Veterinary Monitor Operator's Manual*.
 - Input the network information manually: On the network setup tab of the anesthesia machine and the monitor, set that the IP address and gateway of the anesthesia machine and monitor are in the same network segment, and the submask is the same.
3. Perform the following procedure on the **[Monitor Device Connection]** tab of the anesthesia machine.
 - a. Confirm the **[Device Name]** and **[Monitor Device IP Address]**, and select the desired monitoring device.
 - b. Select **[Connect]**.
A message **[Connected]** is displayed in the lower left corner of the **[Monitor Device Connection]** tab, indicating the connection is successful.

5.9 Power off the System

Power off the system by pressing  button in standby mode.

6 Alarms

6.1 Overview

Alarms refer to the alerts provided by the anesthesia machine to health care professionals in sounds or other forms when the animal that the machine is used on suffers an exceptional change in vital signs, or when the machine suffers a fault that prevents its proper functioning.

NOTE:

- When the equipment is turned on, the system will monitor whether the alarm sound works normally. In normal condition, the equipment will give out a beep. If the sound does not work, do not use this equipment and contact the technical support immediately.
 - When multiple alarms of different priorities occur simultaneously, the machine selects the alarm of the highest priority and gives visual and audible alarm indications accordingly.
 - If more than one alarm of the same level are triggered simultaneously, the alarm messages will be displayed in the sequence of alarm generation.
 - If the equipment is powered off for less than 30 seconds and then powered on, the alarming settings will be restored to the status before the system was powered off.
-

6.2 Alarm Types

The equipment provides three categories of alarms in the alarm message field on the screen: physiological alarms, technical alarms and prompt messages.

- **Physiological Alarm:**
A physiological alarm is usually triggered when a physiological parameter value of the animal exceeds the preset alarm limits, or the animal suffers a physiological abnormality.
- **Technical Alarm:**
A technical alarm, also called system error message, is triggered when a system function fails or the monitoring result presents distortion because of improper operation or system faults.
- **Prompt messages:**
Strictly speaking, prompt messages are not alarms. They are the messages about the system statuses apart from physiological and technical alarms, and prompt messages usually do not involve the animal's vital signs.

6.3 Alarm Priority

The anesthesia machine's alarms can be divided into high priority alarms, medium priority alarms and low priority alarms by severity.

6.4 Alarm Signals

When an alarm is triggered, the machine will alert the user through the following visual or audible alarm signals:

- Audible alarm
- Alarm message
- Flashing parameter

6.4.1 Audible Alarm

The machine plays different alarm tones to indicate different alarm priorities.

- High priority alarm: The high priority alarm tone is played.
- Med priority alarm: The medium priority alarm tone is played.
- Low priority alarm: The low priority alarm tone is played.

6.4.2 Alarm Messages

Alarm messages are displayed in the alarm message field of the ventilator when an alarm is triggered. The system uses different background colors to distinguish priorities of alarm messages:

- High priority alarm: red
- Med priority alarm: yellow
- Low priority alarm: cyan

The following symbols are displayed before alarm messages to distinguish priorities of alarm messages:

- High priority alarm: !!!
- Med priority alarm: !!
- Low priority alarm: !

6.4.3 Auditory Messages

- Startup selftest sound: “di”.
- Key click sound: “da” adjustable sound pressure level.



6.5 Set Alarm Volume

WARNING

Do not rely exclusively on the audible alarm system when using the equipment. Setting the alarm volume to a low level may result in a hazard to the animal. Always keep an eye on the animal's actual clinical situations.

NOTE:

A-weighted sound pressure level of audible alarm signals: not less than 45dB and not greater than 85 dB.


1. Select [Alarm Setup] → [Alarm Volume].
2. Set [Alarm Volume]:  indicates the lowest alarm volume, and  indicates the highest alarm volume. Adjust the volume by sliding from 0-10. If there are no current alarms, the system will play a low-priority alarm tone once based on the selected alarm volume.

6.6 Set Alarm Limits

NOTE:

- An alarm will be triggered when a parameter value is higher than the high alarm limit or lower than the low alarm limit.
- During operation, pay frequent attention to the alarm limits of parameters to ensure that they are appropriately set.
- When the equipment is restarted after the system is powered off for less than 60 seconds, the alarm settings before the loss of power can be restored. When the equipment is restarted after the system is powered off for longer than 120 seconds, the system will automatically load the default settings that the operator saved. If the power outage lasts between 60 to 120 seconds, the anesthesia machine may automatically restore the recent settings or automatically load the user settings.
- When the 120 s countdown time is up, the Audio Pause status terminates and audible alarm tones start again.
- A hazard can exist if different alarm presets are used for the same or similar equipment in any single area.

Select [Alarm Setup] → [Limits] or click the flashing module parameters to enter the alarm limit setting menu and set related alarm limit of ventilation parameters and module parameters.

After setting the alarm limit, select  → [System] → [Profile] to save the current profile as default. In the next time of adjusting the alarm limit, click [Alarm Setup] → [Load Alarm Defaults] to renew the default settings.

6.7 Audio Pause

WARNING

Pay close attention to the animal and anesthesia machine to ensure that no alarm messages are overlooked during the Audio Pause period. When the alarm triggering condition remains for long without any countermeasures taken, the animal or equipment may be subject to hazards.

NOTE:

- In the Audio Pause state, all the other alarm methods function properly except audible alarms.
 - In the Audio Pause state, if a new technical or physiological alarm is triggered, the system will automatically exit the current Audio Pause state and resume audible alarms.
 - When the 120-second countdown is over, the system will exit the Audio Pause state and resume audible alarms.
-

6.7.1 Set Audio Pause

Press [**Audio Pause**] to enable the Audio Pause state which lasts 120 seconds. The action can mute the current alarm tones.

6.7.2 Cancel Audio Pause

In the Audio Pause state, when [**Audio Pause**] button is pressed, the system will exit the current Audio Pause state and resume audible alarms, and the Audio Pause icon and countdown timer on the screen will also disappear.

6.8 Current Alarms

When the alarm is triggered, select the alarm message zone and the current alarm messages and alarm priority can be viewed. For some alarms, you can select the triangle button on the right side to view related help information.

6.9 Responses to Alarms

Follow the steps below to take appropriate response measures when the anesthesia machine triggers an alarm:

1. Check the animal's condition.
2. Identify the alarming parameter or the alarm type.
3. Identify the cause of the alarm.
4. Eliminate the cause of the alarm.
5. Check whether the alarm has been cleared.

For specific response measures for various alarms, see “B Alarm Messages”.

 WARNING

Check whether the animal's ventilation is adequate when an alarm is activated to prevent harm to the animal. Identify and eliminate the cause of the alarm. Re-adjust the alarm limits only when they are inappropriate for the current situation.

⚠ CAUTION

Contact the Technical Support if the alarm persists without obvious cause.

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7 Maintenance

7.1 Maintenance Schedule

The schedules listed below are the minimum frequency based on 2,000 hours of usage per year. The equipment should be serviced more frequently if used more than this yearly usage.

NOTE:

During cleaning and installation, inspect the parts and seals for damage. Replace and repair them if necessary.

Minimum Maintenance Frequency	Maintenance
Every day	<ul style="list-style-type: none">• Check the weight of the anesthesia gas filter canister;• Check the O₂ flush function;• Use soft cloths, mild soap and water to clean the surface of the anesthesia machine and CO₂ absorber canister.
Every week	Check whether the inspiratory/expiratory gasket is damaged; check whether the inspiratory/expiratory valve is damaged or coiled; calibrate the pressure sensor.
Every two weeks	Drain the vaporizer.
Every month	Clear the water gathered in the CO ₂ module watertrap.
Every year	Calibrate the CO ₂ module.
Every three years	Replace the lithium battery and contact the Technical Support for details.

Minimum Maintenance Frequency	Maintenance
On-demand	<ul style="list-style-type: none"> • Replace the soda lime in the canister if the soda lime color changes. • Replace the delivery system hose if it is damaged. • Replace the gas supply hose if it is damaged. • Contact Customer Service Department or sales representative to replace the APL valve if its release pressure deviation is too large; If the APL valve is in the MIN position, the breathing bag is swollen, and the airway pressure exceeds 5 cmH₂O, contact Customer Service Department or sales representative. • Replace the Anesthesia gas filter canister if it is overweight the range recommended by the manufacture. • Replace the HEPA filter if it is blocked. • Zero the weigher after replacing the anesthesia gas filter canister.
Every day	<ul style="list-style-type: none"> • Check the weight of the anesthesia gas filter canister; • Check the O₂ flush function; • Use soft cloths, mild soap and water to clean the surface of the anesthesia machine and CO₂ absorber canister.
Every week	Check whether the inspiratory/expiratory gasket is damaged; check whether the inspiratory/expiratory valve is damaged or coiled; calibrate the pressure sensor.
Every two weeks	Drain the vaporizer.
Every month	Clear the water gathered in the CO ₂ module watertrap.

7.2 Electrical Safety Inspection

NOTE:

- Perform an electrical safety inspection after servicing or routine maintenance. Before performing the electrical safety inspection, ensure that all the covers, panels, and screws are correctly installed.
- It is recommended that a specialized company or the manufacturer be entrusted to conduct electrical safety tests. The electrical safety inspection should be performed once a year.

1. Perform protective earth resistance test:
 - a. Plug the probes of the analyzer into the protective earth terminal of the AC power cord and the screw.
 - b. Test the earth resistance with a current of 25A.
 - c. Verify the resistance is less than 0.1ohms (100m ohms).
 - d. If the resistance is larger than 0.1ohms (100m ohms) but less than 0.2ohms (200m ohms), disconnect the AC power cord and plug the probe, that was previously plugged in the protective earth terminal of the AC power cord, into the protective earth contact of the power outlet. Repeat steps a to c.

2. Perform the following earth leakage current tests:
 - Normal polarity
 - Reverse polarity
 - Normal polarity with open neutral
 - Reverse polarity with open neutral
3. Verify the maximum leakage current does not exceed 500 μA (0.5 mA) in the first two tests. While for the last two tests, verify that the maximum leakage current does not exceed 1000 μA (1 mA).

NOTE:

Ensure the safety analyzer is authorized by certificate organizations (UL, CSA, AAMI, etc.). Follow the instructions of the analyzer manufacturer.

7.3 Methods for Cleaning and Disinfection

WARNING

- **During cleaning and disinfection, ensure the applicability and correctness of the cleaning and disinfection methods.**
- **Keep all liquids away from electronic components. Prevent liquid from penetrating into the equipment casing.**
- **Only all the parts and accessories are dry after cleaning or disinfection can the machine be connected with the AC power.**

NOTE:

- Clean and disinfect the machine as needed before the first use of the equipment. Refer to this chapter for the cleaning and disinfection methods.
- Do not use abrasive cleaning agents (such as steel wool, silver polish and cleaning agents). The pH value of cleaning solutions must be within the 7.0–10.5 range.
- During cleaning the bottom of the circuit, do not wipe the cable terminal directly, otherwise the cables will be oxidized or corroded.

Cleaning and disinfection methods	Category
Cleaning water	Cleaning agent
Soap solution (pH 7.0–10.5)	Cleaning agent
Alcohol (75%)	Moderately efficient disinfectant
Ultraviolet radiation	/

7.3.1 Wiping

- When cleaning the exteriors of the anesthesia machine, use wet cloths soaked in alkaline cleaning agents (such water or soap-suds of pH 7.0 to 10.5) to wipe the surface of the equipment. When disinfecting the exteriors of the anesthesia machine, use wet cloth soaked in moderately efficient disinfectant (ethanol (75%)) to wipe the surface of the equipment.
- When the cleaning or disinfection is completed, use dry and lint-free cloths to remove the residual cleaning or disinfectant agent solution.

⚠ CAUTION

Use dry and lint-free cloths to clean the display rather than using liquids.

7.3.2 Ultraviolet Radiation

During the disinfection of the anesthesia machine, place it at a 30 W light in one meter for at least 60 minutes.

⚠ CAUTION

Ultraviolet radiation is harmful to the human body. Do not stay in the room during ultraviolet radiation.

8 Accessories

WARNING

- Use the accessories specified in this chapter only. Using other accessories may lead to inaccurate measured values or equipment faults.
- Disposable accessories shall be used only once. Repeated use may lead to performance degradation or cross-infection.
- Please do not use an accessory that shows signs of damage in its package or itself.
- The equipment and its accessories, at the end of their service lives, shall be disposed of in compliance with the guidelines regulating the disposal of such products and in accordance with local regulations for contaminated and biologically hazardous items.

Category	Material Description
Vaporizer adapter	Key filler adapter for filling the vaporizer, Isoflurane
	Key filler adapter for filling the vaporizer, Sevoflurane
Pipeline	Disposable Accessory Kit, Small, Vet
	Disposable Accessory Kit, Large, Vet
	Disposable Coaxial Circuit, 1.5M, Vet
Reservoir Bag	Breathing Bag 0.5L without Latex, Vet
	Breathing Bag 1L without Latex, Vet
	Breathing Bag 2L without Latex, Vet
	Breathing Bag 3L without Latex, Vet
Gas supply hose	O ₂ supply hose, British standard, NIST, 5m, 34I-OXY-BS/NS-5
	Air supply hose, British standard, NIST, 5m, 34I-AIR-BS/NS-5
	O ₂ supply hose, Germany standard, NIST, 5m, 34I-OXY-GS/NS-5
	Air supply hose, Germany standard, NIST, 5m, 34I-AIR-GS/NS-5
	O ₂ supply hose, Australian standard, NIST, 5m, 34I-OXY-SIS/NS-5
	Air supply hose, Australian standard, NIST, 5m, 34I-AIR-SIS/NS-5
	O ₂ supply hose, French standard, NIST, 5m, 34I-OXY-FS/NS-5
	Air supply hose, French standard, NIST, 5m, 34I-AIR-FS/NS-5

Category	Material Description
Gas supply hose	O ₂ supply hose, US standard, BS, DISS, 5m, 34U-OXY-BS/DS-5
	Air supply hose, US standard, BS, DISS, 5m, 34U-AIR-BS/DS-5
	Air supply hose, US standard, Chemetron, DISS, 5m, 34U-AIR-CH/DS-5
	O ₂ supply hose, US standard, Chemetron, DISS, 5m, 34U-OXY-CH/DS-5
	Air supply hose, US standard, Ohmeda, DISS, 5m, 34U-AIR-OH/DS-5
	O ₂ supply hose, US standard, P-B, DISS, 5m, 34U-OXY-PB/DS-5
	O ₂ supply hose, US standard, Ohmeda, DISS, 5m, 34U-OXY-OH/DS-5
	Air supply hose, US standard, P-B, DISS, 5m, 34U-AIR-PB/DS-5
CO ₂	Adapter, Airway, STRT, Small, Vet
CO ₂	Adapter, Airway, STRT, Large, Vet
	Adapter, Airway, ELBOW, Large, Vet
	DRYLINE II Water Trap, Large, Vet
	DRYLINE II Water Trap, Small, Vet
	Sampling Line, Large, 2.5M, Vet
	Sampling Line, Small, 2.5M, Vet
	M02D sidestream CO ₂ accessory kit, large animal
	M02D sidestream CO ₂ accessory kit, small animal
CO ₂	Low dead space adapter, 2.0-3.5mm, Vet
AGSS	Passive AGSS accessory kit
	AGSS low flow receiving hose, from AGSS assembly to hospital's waste gas disposal system
	AGSS high flow receiving hose, from AGSS assembly to hospital's waste gas disposal system
	AGSS assembly, high-flow, low vacuum
	AGSS assembly, low-flow, high vacuum
	AGSS kit, high flow, low vacuum
	AGSS kit, low flow, high vacuum
	AGSS waste gas transfer hose, from main unit to AGSS assembly
	Adapter for AGSS, S type, 30F, 22M
	Adapter for AGSS, L type, 22F, 22M
	Tube for waste anesthetic gas absorb, silicon
	ACGO
Mapleson C type	
ACGO	Bain System
	Bain circuit, disposable, 1.2M, Vet

Category	Material Description
Software	PCV software function
	SIMV software function
Power cord	Power cord 5M (European standard)
	Power cord 250V 10A 5M (British standard)
	Power cord 125V 15A 5M (US standard)
	Power cord 250V 10A 5M NEMA5-15P plug
	Power cord 10A 250V 5M (Indian standard)
	Power cord 250V 10A 5M (Brazil standard)
	Power cord 250V 10A 5M (South African standard)
	Power cord 5M (Australian standard)
Other	Small animal anesthesia masks kit
	Trolley assembly
	Oxygen concentrator tray kit (DISS)
	Sundries basket kit
	Hose clamps: size 9.5-12mm, galvanized
	Infusion pump holder
	Veta 3/5 top monitor bracket kit
	Veta 3/5 Gas cylinder installation kit
Other	Waste anesthetic gas absorb tray, with weighing
Other	Oxygen concentrator tray kit (NIST)

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A Product Specifications

A.1 Safety Specifications

Item	Description
Type of protection against electric shock	Class I equipment with internal electrical power supply. Where the integrity of the external protective earth (ground) in the installation or its conductors is in doubt, the equipment shall be operated from its internal electrical power supply (batteries).
Degree of protection	Type BF, defibrillation-proof
Degree of protection against harmful ingress of water	IPX1
Disinfection and	Recommended by manufactures
Operating mode	Continuous
Degree of protection against hazards of explosion	Ordinary equipment, without protection against explosion; not for use with flammable anesthetics.
Degree of mobility	Mobile (including the base and casters)

A.2 Environment Specifications

Item	Temperature (°C)	Relative humidity (non-condensing)	Barometric pressure (kPa)
Item	Temperature (°C)	Relative humidity (non-condensing)	Barometric pressure (kPa)
Operation	10 to 40	15% to 95%	70 to 106.7
Storage	-20 to 60	10% to 95%	50 to 106.7

A.3 Power Supply Specifications

External AC power supply

Item	Description
Input voltage	100 to 240 V~

Item	Description
Input frequency	50 Hz/60 Hz

Internal Batteries

Item	Description
Number of batteries	1
Battery type	Lithium battery
Rated battery voltage	10.95 V
Battery capacity	5,000 mAh
Minimum battery run time	240 minutes (powered by one new fully-charged battery in standard working condition)

A.4 Physical Specifications

Equipment Noise

Item	Description
Equipment noise	The A-weighted average sound pressure level at one meter away ≤ 45 dB (A).

Dimensions and weights

Item	Description
Dimensions	<p>Overall size (excluding the trolley, anesthesia gas filter canister, oxygen generator; including accessories):</p> <p>(790 mm\pm25 mm)\times(515 mm\pm25 mm)\times(435 mm\pm25 mm) (Height\timesWidth\timesDepth)</p> <p>Overall size (excluding the anesthesia gas filter canister, oxygen generator; including the trolley and accessories):</p> <p>(1375 mm\pm25 mm)\times(620 mm\pm25 mm)\times(690 mm\pm25 mm) (Height\timesWidth\timesDepth)</p>
Standard weight	<p>≤ 30 kg (excluding the trolley, anesthesia gas filter canister, oxygen generator; including accessories)</p> <p>≤ 43 kg (excluding the anesthesia gas filter canister, oxygen generator; including the trolley and accessories)</p>

Item	Description
Maximum weight	<p>≤85 kg (excluding the trolley; including anesthesia gas filter canister, oxygen generator, monitor, infusion pumps and accessories)</p> <p>≤100 kg (including the trolley, anesthesia gas filter canister, oxygen generator, monitor, infusion pumps and accessories)</p>

Caster

Item	Description
Caster	Four casters with brakes.

Display

Item	Description
Size	8"
Resolution	1024×768
Brightness	Adjustable

LED Indicator and Audio Indicator

Item	Description
AC power LED	One (green. Lit when an AC power supply is connected)
Battery LED	One (green. Lit when an AC power supply is connected; and extinguished when the battery is full or the machine is powered off.)
Speaker	Produces alarm tones and key tones; and supports multi-level volumes.

Connector

Item	Description
Multi-functional communication connector	One DB9 male connector
Wired network connector	One RJ-45 network connector (8PIN, class 5)
USB connector	One A-type connector

A.5 Pneumatic System Specifications

Gas Supply

Item	Description
Gas type	Air, oxygen
Gas supply pressure range	280 kPa to 600 kPa (40 Psi~87 Psi)
Input connector	NIST or DISS

Oxygen Control

Item	Description
O ₂ flush	10 L/min~15 L/min (gas supply pressure: 280 kPa)

Flowmeter

Item	Description
Flow range	0 L/min ~ 4 L/min

A.6 Breathing System Specifications

Connector

Item	Description
Manual bag connector	Coaxial 22 mm male/15 mm female conical connector
Inspiration connector	Coaxial 22 mm male/15 mm female conical connector
Expiration connector	Coaxial 22 mm male/15 mm female conical connector
Exhaust connector	30 mm male conical connector

Airway Pressure Gauge

Item	Description
Range	-20 cmH ₂ O~100 cmH ₂ O

APL Valve

Item	Description
Range	0 cmH ₂ O~70 cmH ₂ O

A.7 Ventilator Specifications

Controlled Parameters

Parameter	Range
Vt	5 mL~1500 mL
P _{insp}	5 cmH ₂ O~50 cmH ₂ O
ΔP _{supp}	3 cmH ₂ O~50 cmH ₂ O
PEEP	OFF, 3 cmH ₂ O~30 cmH ₂ O
RR	2 bpm~60 bpm
Min RR	2 bpm~60 bpm
I:E	4:1~1:8
T _{insp}	0.2s~10.0s
P-Trig	-20 cmH ₂ O~-0.2 cmH ₂ O
F-Trig	0.2 L/min~15 L/min

Monitored Parameters

Parameter	Range
Vt	0 mL~3000 mL
MV	0 L/min~100 L/min
PEAK	-20 cmH ₂ O~120 cmH ₂ O
PEEP	0 cmH ₂ O~70 cmH ₂ O
RR	0 bpm~120 bpm

A.8 Ventilator Accuracy

Control Accuracy

Item	Description
Vt	<75 mL: ± 15 mL ≥ 75 mL: ± 20 mL or $\pm 10\%$ of set value, whichever is greater.
P _{insp}	± 3.0 cmH ₂ O or $\pm 8\%$ of set value, whichever is greater.
ΔP_{supp}	
PEEP	OFF: ≤ 4.0 cmH ₂ O 3 cmH ₂ O~30 cmH ₂ O: ± 3.0 cmH ₂ O or $\pm 10\%$ of set value, whichever is greater.
RR	± 1 bpm or $\pm 10\%$ of set value, whichever is greater.
Min RR	
I:E	2:1 to 1:4: $\pm 10\%$ of set value Other range: $\pm 25\%$ of set value
T _{insp}	± 0.2 s

Monitoring Accuracy

Item	Description
Vt	<75 mL: ± 15 mL ≥ 75 mL: ± 20 mL or $\pm 10\%$ of actual reading, whichever is greater.
MV	± 1 L/min or $\pm 15\%$ of actual reading, whichever is greater.
PEAK	± 3.0 cmH ₂ O or $\pm 8\%$ of actual reading, whichever is greater.
PEEP	± 3.0 cmH ₂ O or $\pm 10\%$ of actual reading, whichever is greater.
RR	± 1 bpm or $\pm 5\%$ of actual reading, whichever is greater.

A.9 Alarms

Parameter		Range	Note
MV	High Limit	0.2 L/min~100.0 L/min	When the MV range is 0.0 L/min~15.0 L/min, the high limit should be 0.2 L/min higher than the low limit; when the MV range is 15.0 L/min~100.0 L/min, the high limit should be 1 L/min higher than the low limit.
	Low Limit	0.0 L/min~99.0 L/min	

Parameter		Range	Note
PEAK	High Limit	2 cmH ₂ O~100 cmH ₂ O	High limit is 2 cmH ₂ O higher than the low limit.
	Low Limit	0 cmH ₂ O~98 cmH ₂ O	
Vt	High Limit	5 mL~1600 mL	High limit is 5 ml higher than the low limit.
	Low Limit	OFF, 0 mL~1595 mL	
RR	High Limit	4 bpm~100 bpm, OFF	High limit is 2 bpm higher than the low limit.
	Low Limit	OFF, 2 bpm~98 bpm	

A.10 CO₂ Module

Item	Description
CO ₂ range and resolution	0.0% (0 mmHg) ~ 20% (152 mmHg), and the resolution is 0.1%/1 mmHg
CO ₂ accuracy	0.0% (0 mmHg) ~ 5.0% (40 mmHg): ±0.2 vol.% (±2 mmHg) 5.0% (41 mmHg)~ 10% (76 mmHg) (excludes 5%): ±5% of actual reading 10% (77 mmHg)~20% (152 mmHg) (excludes 10%): ±10% of actual reading
Sampling rate	Neonate watertrap: 90 mL/min; Adult watertrap: 120 mL/min; Accuracy: ±15% of set value or ±15 mL/min, whichever is greater.

Parameter		Range	Adjustment step	Note
EtCO ₂	High Limit	OFF, 2 mmHg~99 mmHg	1 mmHg	The high limit is 2 mmHg higher than the low limit.
	Low Limit	OFF, 0 mmHg~97 mmHg		
FiCO ₂	High Limit	OFF, 1 mmHg~99 mmHg		N/A

A.11 Anesthetic Vaporizer

Item	Description
Filling methods	Isoflurane: Pour Fill, Key Filler Sevoflurane: Pour Fill, Key Filler, Quik-Fil
Weight	6.0 kg ± 0.5 kg (empty) 6.5 kg ± 0.5 kg (full)

Item	Description
Filling volume	360 mL \pm 60 mL (dry wick) 300 mL \pm 60 mL (moist wick) 260 mL \pm 60 mL (between the minimum and maximum marks)
Concentration range	Isoflurane: 0 vol.%~6 vol.% Sevoflurane: 0 vol.%~8 vol.%
Concentration accuracy range	\pm 0.25vol.% or \pm 20% of set value, whichever is greater.

A.12 Anesthetic Gas Scavenging System (AGSS)

Active AGSS

Type of the applicable disposable system	High flow	Low flow
Extract flow	75 L/min~105 L/min	25 L/min~50 L/min

Passive AGSS

Item	Description
Type of connector	30 mm male conical connector

Weigher

Item	Description
Support configuration	\leq 130 mm gas filter canister
Maximum load	2 kg

B Alarm Messages

This chapter lists physiological and technical alarm messages:

Note that in this chapter:

- Default alarm level: H for high, M for medium and L for low.
- Corresponding response actions are given for each alarm message. If the problem persists after the response actions have been taken, contact a service personnel.

B.1 Physiological Alarm Messages

Alarm message	Default alarm level	Cause and response action
Apnea	M	No breath has been detected within the apnea time. 1. Check whether breathing circuit is leaking or disconnected. 2. Ensure the position of Auto/Manual switch.
Apnea>2 min	H	No breath has been detected within the last 120 seconds. 1. Check whether ventilation starts. 2. Check whether breathing circuit is leaking or disconnected. 3. Ensure the position of Auto/manual switch.
Paw Too High	H	Paw > high alarm limit setting. 1. Check alarm limit: PEAK High. 2. Check ventilation settings: P _{insp} , V _t , PEEP, etc. 3. Check whether breathing circuit is kinked or blocked.
Paw Too Low	H	The real time PAW is lower than the Paw low alarm limit setting for 20 seconds. 1. Check alarm limit: PEAK Low. 2. Check ventilation settings: P _{insp} , V _t , PEEP, etc. 3. Check whether breathing circuit is leaking or disconnected.
Pressure Limiting	L	$Paw \geq \text{Max}(5\text{cmH}_2\text{O}, \text{PEAK High Limit}-5\text{cmH}_2\text{O})$. 1. Check alarm limit: PEAK High. 2. Check ventilation settings: V _t .
MV Too High	M	MV > high alarm limit setting. 1. Check alarm limit: MV Low. 2. Check ventilation settings: P _{insp} , V _t , RR, etc.

Alarm message	Default alarm level	Cause and response action
MV Too Low	H	MV < low alarm limit setting.
		<ol style="list-style-type: none"> 1. Check alarm limit: MV High. 2. Check ventilation settings: P_{insp}, V_t, RR, etc.
Continuous Airway Pressure	H	The P _{aw} in the breathing circuit is greater than sustained airway pressure alarm limit for 15 seconds.
		<ol style="list-style-type: none"> 1. Check APL valve setting while in manual mode. 2. Check whether breathing circuit or AGSS is blocked.
Negative Pressure	H	P _{aw} < -10 cmH ₂ O for 1 second.
		<ol style="list-style-type: none"> 1. Check the negative pressure suction. 2. Check whether AGSS works normally.
Vt Too High	M	V _t > high alarm limit setting.
		<ol style="list-style-type: none"> 1. Check alarm limit: V_t High. 2. Check ventilation settings: P_{insp}, V_t, etc.
Vt Too Low	M	V _t < the low alarm limit setting.
		<ol style="list-style-type: none"> 1. Check alarm limit: V_t Low. 2. Check ventilation settings: P_{insp}, V_t, etc. 3. Check whether breathing circuit is leaking or blocked.
RR Too High	L	RR > high alarm limit setting.
		<ol style="list-style-type: none"> 1. Check alarm limit: RR High. 2. Check ventilation settings: RR, F-Trig/P-Trig, etc. 3. Check whether breathing circuit is leaking or blocked.
RR Too Low	L	RR < low alarm limit setting.
		<ol style="list-style-type: none"> 1. Check alarm limit: RR Low. 2. Check ventilation settings: RR, F-Trig/P-Trig, etc.
EtCO ₂ Too High	M	EtCO ₂ > high alarm limit setting.
		<ol style="list-style-type: none"> 1. Check alarm limit: EtCO₂ High. 2. Check whether need to replace soda lime in the CO₂ absorber canister.
EtCO ₂ Too Low	M	EtCO ₂ < low alarm limit setting.
		<ol style="list-style-type: none"> 1. Check alarm limit: EtCO₂ Low. 2. Check whether the sampleline is disconnected.
FiCO ₂ Too High	M	FiO ₂ > high alarm limit setting.
		<ol style="list-style-type: none"> 1. Check alarm limit: EtCO₂ High. 2. Check whether need to replace soda lime in the CO₂ absorber canister.

Alarm message	Default alarm level	Cause and response action
Apnea CO ₂	H	No breath is detected and Apnea time \geq Apnea alarm time.
		<ol style="list-style-type: none"> 1. Check whether ventilation starts. 2. Ensure the sampleline is correctly connected to breathing circuit. 3. Check animal's breathing ability.
The CO ₂ targets are not achieved	M-H	Automatic adjustment of parameters has reached the limit.
		Check the cause of CO ₂ overrange. Manually adjust the parameters if necessary.

B.2 Technical Alarm Messages

Alarm message	Default alarm level	Cause and response action
Bundle Version Error	H	Incompatible firmware version is installed.
		Please contact the Technical Support.
Bundle Version: Time out	H	Bundle version selftest result cannot be obtained due to communication error.
		Please contact the Technical Support.
Ventilator Selftest Error	H	Cause: <ol style="list-style-type: none"> 1. Board self-test error. 2. After power on, CPU board can't communicate with the ventilator board.
		Response action: <ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists.
Ventilator Selftest: Time out	H	Ventilator selftest result cannot be obtained due to communication error.
		<ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists.
Ventilator Voltage Error	H	Ventilator voltage error.
		<ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists.

Alarm message	Default alarm level	Cause and response action
Flow Sensor Failure	L	Ventilator flow is out of range.
		<ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists.
Calibrate Pressure Sensor	L	Cause:
		<ol style="list-style-type: none"> 1. Cal. Table isn't found in EEPROM. 2. Checksum of Calibration table don't match.
		Please contact the Technical Support for pressure calibration.
Ventilator Initialization Error	H	After power on, CPU board can't send the parameter settings to ventilator board.
		<ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists.
Ventilator Initialization: Time out	H	Ventilator Initialization result cannot be obtained due to communication error.
		<ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists.
Power Supply Voltage Error	H	Power supply voltage error.
		<ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists.
Manual Only	M	Cause:
		<ol style="list-style-type: none"> 1. Power on self test failed and the result is "Manual Only". 2. The alarm "Blower temp too high" is triggered.
		Response action:
		<ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists. 3. When "Blower temp too high" alarm is triggered, wait for the blower temperature drops until the "Blower temp too high" alarm is disappeared.

Alarm message	Default alarm level	Cause and response action
Auto Ventilation is Non-Functional	H	<p>Cause:</p> <ol style="list-style-type: none"> 1. Power on self test failed and system is in the Auto Ventilation Non-functional state. 2. The alarm “Blower temp too high” is triggered and system is in the Auto Ventilation Non-functional state. <hr/> <p>Response action:</p> <ol style="list-style-type: none"> 1. Repeat the test. 2. Please contact the Technical Support if the problem persists. 3. When “Blower temp too high” alarm is triggered, wait for the blower temperature drops until the “Blower temp too high” alarm is disappeared.
RT Clock Needs Battery	H	<p>There is no button cell available in the system, or the battery is empty.</p> <hr/> <p>Please contact the Technical Support.</p>
RT Clock Failure	H	<p>RT chip malfunction.</p> <hr/> <p>Please contact the Technical Support.</p>
Power System Comm Stop	H	<p>Lost communication with CPU board for 10 seconds.</p> <hr/> <p>Please contact the Technical Support.</p>
Low Battery Voltage!	H	<p>Battery voltage is low.</p> <hr/> <ol style="list-style-type: none"> 1. Check the power supply. 2. Connect AC power immediately.
System shutting down, Battery depleted!	H	<p>Battery voltage is too low.</p> <hr/> <ol style="list-style-type: none"> 1. Check the power supply. 2. Connect AC power immediately.
Battery Undetected	M	<p>Battery Undetected.</p> <hr/> <p>Please contact the Technical Support.</p>
Battery in Use	L	<p>AC power fail.</p> <hr/> <p>Connected to AC power source.</p>
Pinsp Not Achieved	L	<p>Ppeak don't reach the setting Pinsp in pressure mode.</p> <hr/> <ol style="list-style-type: none"> 1. Check ventilation settings: Pinsp, ΔPsupp, PEEP etc. 2. Check whether breathing tube is leaking or Disconnected. 3. Solve the “Paw Too High” alarm.
Vt Not Achieved	L	<p>Vt didn't reach the setting Vt in volume mode.</p> <hr/> <ol style="list-style-type: none"> 1. Check ventilation settings: Vt, PEEP, etc. 2. Check whether breathing circuit is leaking or blocked. 3. Solve the “Pressure Limit” alarm and “Paw Too High” alarm.

Alarm message	Default alarm level	Cause and response action
Pressure Monitoring Channel Failure	M	For auxiliary control module: The monitoring value of the PEEP sensor or pressure sensor is out of range. For ventilator control board: 1. The monitoring value of the PEEP sensor or pressure sensor is out of range. 2. The zero point of the PEEP sensor or pressure sensor is abnormal.
		Please contact the Technical Support.
Circuit Leak	H	1. Circuit leak. 2. The animal is not connected.
		Check whether the breathing circuit is leaking or disconnected.
Ventilator Comm Stop	H	Lost communication with CPU board for 10 seconds.
		Please contact the Technical Support.
Calibrate Pressure Sensor	L	1. Cal. Table isn't found in EEPROM. 2. Checksum of Calibration table don't match.
		Please contact the Technical Support for pressure calibration.
Replace HEPA Filter	L	HEPA filter occluded, resistance increased.
		Please contact the Technical Support.
Blower Temperature High	L	Blower Temperature exceeds the threshold.
		1. Check if the operating ambient temperature of the machine exceeds the maximum operating temperature specified by the vendor. 2. Check if the fan inlet and outlet are occluded. If yes, clear the foreign substance and dust. 3. Check the rotation of the fan. If it runs abnormally (such as abnormal sound or rotation speed), replace the fan.
Blower Temp Sensor Failure	M	Turbine blower Temp Sensor Failure.
		Please contact the Technical Support.
Blower Failure	H	Blower Failure.
		Please contact the Technical Support.
Blower Temp Too High	H	Blower temperature is too high and auto ventilation is non-functional.
		1. Start manual ventilation in emergency. 2. Stop using auto ventilation until the blower temperature drops and the "Blower temp too high" alarm disappear. 3. Please contact the Technical Support if the problem persists.

Alarm message	Default alarm level	Cause and response action
Weigher Failure	L	Weigher Failure.
		Please contact the Technical Support.
No Fresh Gas	M	No fresh gas is detected in non-standby mode.
		Adjust the flowmeter to open the fresh gas.
CO ₂ Module Error	H	<ol style="list-style-type: none"> 1. CO₂ Comm Stop. 2. CO₂ Hardware Error. 3. CO₂ System Error. 4. CO₂ Init Error.
		Please contact the Technical Support.
CO ₂ Module High Temp	L	CO ₂ Sensor Temp too high (greater than 63 °C).
		Please contact the Technical Support.
CO ₂ Sampleline Occluded	L	Sampleline Occluded.
		<ol style="list-style-type: none"> 1. Check the sampling tube for occlusion. 2. Replace the sampling line. 3. Please contact the Technical Support if the problem persists.
CO ₂ No Watertrap	L	CO ₂ No Watertrap or Watertrap disconnected.
		Check the water trap.
EtCO ₂ Over Range	L	The monitoring value exceeds the measurable range.
		Please contact the Technical Support.
FiCO ₂ Over Range	L	The monitoring value exceeds the measurable range.
		Please contact the Technical Support.
CO ₂ Zero Failed	L	CO ₂ module Error.
		Please contact the Technical Support.
CO ₂ Change Watertrap	L	Need to change the watertrap.
		Check the watertrap. Replace the watertrap.
CO ₂ Self Test Error	L	CO ₂ Self Test Error.
		Please contact the Technical Support.
CO ₂ Self Test: Time out	L	CO ₂ Self Test selftest result cannot be obtained due to communication error.
		Please contact the Technical Support.

Alarm message	Default alarm level	Cause and response action
CO ₂ data is abnormal. Check the connection.	L	No CO ₂ data is available (the network is disconnected and the anesthesia machine does not have CO ₂ data). The measured EtCO ₂ value is smaller than 5 mmHg for 1 minute or its value is invalid for 1 minute.
		<ol style="list-style-type: none"> 1. Check whether the network cable is connected. 2. Check whether the sampling port falls off. 3. Check whether the CO₂ module works properly. 4. Check whether the monitor works properly.

B.3 Prompt Messages

Alarm message	Remark
Volume and Apnea Alarms are OFF	This message appears when the “Alarms” is set to “Off” in the Manual mode.
CO ₂ and CO ₂ Apnea Alarms are OFF	This message appears when “CO ₂ Alarms” is set to “Off” in the Manual mode.
Save Profile Failure	This message appears when any fault occurs in the case of save as user defaults.
Demo Mode - Not for Clinical Use	This message appears when the machine is working in demo mode.
Backup Ventilation	This message appears when Backup Ventilation is triggered in the VS mode.
Replace Anesthesia Gas Filter Canister	This message appears when weight increase of Anesthesia Gas Filter Canister exceeds the replacement remind setting.
Weigher Cable Disconnected	This message appears when weigher cable is disconnected.
Fresh Gas is On	This message appears when flowmeter does not adjust to zero in standby mode.
CO ₂ Zero Running	CO ₂ zero is running.
IP Address Conflict	This message appears when the IP address of the anesthesia machine is the same as that of another device in the LAN.

C Factory Defaults

C.1 Ventilation Parameters

Item	Defaults
Vt	20 mL
VtRef	20 mL
Weight	2 Kg
Vt/Weight	10 mL/Kg
Min RR	8 bpm
MaxRR	20 bpm
PEEP	OFF
Trigger	Auto
RR	18 bpm
I:E	1:2
Pinsp	10 cmH ₂ O
Tinsp	1.0 s
ΔPsupp	5 cmH ₂ O

C.2 Setup

Item	Defaults
Main: General: Vt/Weight	10 ml/Kg
Main: General: CO ₂ Scale	0-60 mmHg
Main: General: Screen Brightness	50% of maximum brightness
Main: General: Key Click Volume	30% of maximum volume
Main: Weigher: Set replacement remind for filter canister (Weight increase)	Off
Main: System: Setup: Language/Unit: Language	ENGLISH
Main: System: Setup: Language/Unit: Pressure Unit	cmH ₂ O
Main: System: Setup: Language/Unit: CO ₂ Unit	mmHg

Item	Defaults
Main: System: Setup: Language/Unit: Weight Unit	Kg
Main: System: Setup: Altitude: Altitude Unit	m
Main: System: Setup: Altitude: Altitude	300 m
Main: System: Setup: Time/Date: 24 Hour Time	Off
Main: System: Setup: Time/Date: Time Zone	UTC-05:00
Main: System: Setup: Time/Date: Date Format	YYYY-MM-DD
Main: System: Setup: Time/Date: Day Light Savings	Off
Main: System: Setup: Weigher	On
Main: System: Setup: Network Settings: Obtain IP Address Automatically	On
Main: System: Setup: Network Settings: Obtain DNS Server Address Automatically	On
Main: System: Setup: Network Settings: IP Address	192.168.23.250
Main: System: Setup: Network Settings: Subnet Mask	255.255.255.0
Main: System: Setup: Network Settings: Default Gateway	192.168.23.1
Main: System: Setup: Network Settings: Preferred DNS Server	0.0.0.0
Main: System: Setup: Network Settings: Alternate DNS Server	0.0.0.0
Main: System: Setup: Monitor Device Connection	/

C.3 Alarms

Item	Defaults
Alarm Setup: Limits: MV High Limit	6.0 L/min
Alarm Setup: Limits: MV Low Limit	0.0 L/min
Alarm Setup: Limits: PEAK High Limit	Manual/ACGO mode: 25 cmH ₂ O Auto mode: <ul style="list-style-type: none"> • Weight ≥ 15 kg: 25 cmH₂O • 5 kg ≤ Weight < 15 kg: 22 cmH₂O • Weight < 5 kg: 20 cmH₂O

Item	Defaults
Alarm Setup: Limits: PEAK Low Limit	Auto mode: 4 cmH ₂ O
	Manual mode: OFF
Alarm Setup: Limits: Vt High Limit	1,000 ml
Alarm Setup: Limits: Vt Low Limit	Off
Alarm Setup: Limits: RR High Limit	Off
Alarm Setup: Limits: RR Low Limit	Off
Alarm Setup: Limits: FiCO ₂ High Limit	4 mmHg
Alarm Setup: Limits: EtCO ₂ High Limit	50 mmHg
Alarm Setup: Limits: EtCO ₂ Low Limit	25 mmHg
Alarm Setup: Alarm Volume	30% of maximum volume
Volume and Apnea Alarms	On
CO ₂ Alarms	On

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D EMC

The anesthesia machine meets the requirements of IEC 60601-1-2:2014+A1:2020.

WARNING

- Use of accessories, transducers and cables other than those specified or provided by the manufacturer of anesthesia machine could result in increased electromagnetic emissions or decreased electromagnetic immunity of anesthesia machine and result in improper operation.
- Use of anesthesia machine adjacent to or stacked with other device should be avoided because it could result in improper operation. If such use is necessary, anesthesia machine and the other device should be observed to verify that they are operating normally.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the anesthesia machine, including cables specified by the manufacturer. Otherwise, degradation of the performance of anesthesia machine could result.
- Other devices may interfere with anesthesia machine even though they meet the requirements of CISPR.
- When the input signal is below the minimum amplitude provided in technical specifications, erroneous measurements could result.
- The non-ME EQUIPMENT (e.g. ITE) that is a part of an ME SYSTEM may be disrupted by the electromagnetic interference of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the non-ME EQUIPMENT or shielding the location.

NOTE:

- Anesthesia machine needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided below.
- Use of portable or mobile communications devices will degrade the performance of anesthesia machine.
- Anesthesia machine is intended for use in professional healthcare facility environment, If it is used in special environment, such as magnetic resonance imaging environment, anesthesia machine may be disrupted by the operation of nearby equipment.
- If the essential performance is lost or degraded, it may be necessary to take mitigation measures, such as re-orienting or relocating the ME EQUIPMENT or ME SYSTEM or shielding the location or stopping using anesthesia machine and contact the service personnel.

Cable information

No.	NAME	Cable length	Cable Shielded (Y/N)
1.	Anesthesia System Power input	5m	N
2.	Weigher cable	1.2m	Y

TABLE EMC-1

Guidance and Declaration - Electromagnetic Emissions		
The device is intended for use in the electromagnetic environment specified below. The customer or the user of device should assure that it is used in such an environment.		
EMISSIONS TEST	COMPLIANCE	ELECTROMAGNETIC ENVIROMENT - GUIDANCE
RF emissions CISPR 11	Group 1	The device 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 device. The device is suitable for use in all establishments including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
RF emissions CISPR 11	Class B	
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

NOTE:

- The device needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided below.
- Other devices may interfere with this device even though they meet the requirements of CISPR.
- Preventing conducted RF immunity. Due to technological limitations, the conducted RF immunity level are limited to 3Vrms level, conducted RF interference above 3Vrms may cause wrong diagnosis and measurements. We suggest that you position device further from sources of conducted RF noise.


If the device is operated within the electromagnetic environment listed in Table EMC-2 and Table EMC-3, the device will remain safe and will provide the following basic performances:

- Vdel monitoring accuracy
- CO₂ monitoring accuracy
- Airway pressure monitoring accuracy
- PEEP monitoring accuracy

TABLE EMC-2

Guidance and Declaration - Electromagnetic Immunity			
The device is intended for use in the electromagnetic environment specified below. The customer or the user of device 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	±8 kV contact; ±2 kV, ±4 kV, ±8 kV, ±15 kV air	±8 kV contact; ±2 kV, ±4 kV, ±8 kV, ±15 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; ±1 kV for input/output lines	±2 kV for power supply lines; ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±0,5 kV, ±1 kV line(s) to line(s); ±0,5 kV, ±1 kV, ±2 kV line(s) to earth	±0,5 kV, ±1 kV line(s) to line(s); ±0,5 kV, ±1 kV, ±2 kV line(s) to earth	
Voltage dips, Short interruptions and voltage variation on power supply input voltage IEC 61000-4-11	0% U_T ; 0,5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% U_T ; 1 cycle 70% U_T for 25/30 cycle at 0° 0% U_T ; 250/300 cycle	0% U_T ; 0,5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0% U_T ; 1 cycle 70% U_T for 25/30 cycle at 0° 0% U_T ; 250/300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of our product requires continued operation during power mains interruptions, it is recommended that our product be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 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 AC mains voltage prior to application of the test level.			

TABLE EMC-3

Guidance and Declaration - Electromagnetic Immunity			
The device is intended for use in the electromagnetic environment specified below. The customer or the user of device should assure that it is used in such an environment.			
Immunity test	IEC 60601 Test level	Compliance level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	3 Vrms 0,15 MHz – 80 MHz	3 Vrms 0,15 MHz – 80 MHz	Portable and mobile RF communications device should be used no closer to any part of device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2 \times \sqrt{P}$ $d = 1.2 \times \sqrt{P}$
	6 Vrms in ISM bands and amateur radio bands ^a between 0.15 MHz and 80 MHz	6 Vrms in ISM ^a bands between 0,15 MHz and 80 MHz	
Radiated RF IEC 61000-4-3	3 V/m 80 MHz - 2,7 GHz	3 V/m 80 MHz - 2,7 GHz	$d = 1.2 \times \sqrt{P}$ 80 MHz to 800 MHz $d = 2.3 \times \sqrt{P}$ 800 MHz to 2,7 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 meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey ^b , should be less than the compliance level in each frequency range ^c . Interference may occur in the vicinity of device marked with the following symbol: . 
	10 V/m 80 MHz - 2,7 GHz	10 V/m 80 MHz - 2,7 GHz	

NOTE: 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.

- a. The ISM (industrial, scientific, and medical) bands between 150 kHz and 80 MHz are 6.765 MHz to 6.795 MHz; 13.553 MHz to 13.567 MHz; 26.957 MHz to 27.283 MHz; and 40.66 MHz to 40.70 MHz. The amateur radio bands between 0.15 MHz and 80 MHz are 1.8 MHz to 2.0 MHz, 3.5 MHz to 4.0 MHz, 5.3 MHz to 5.4 MHz, 7 MHz to 7.3 MHz, 10.1 MHz to 10.15 MHz, 14 MHz to 14.2 MHz, 18.07 MHz to 18.17 MHz, 21.0 MHz to 21.4 MHz, 24.89 MHz to 24.99 MHz, 28.0 MHz to 29.7 MHz and 50.0 MHz to 54.0 MHz.
- b. 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 device is used exceeds the applicable RF compliance level above, the device should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the device.
- c. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

TABLE EMC-4

GUIDANCE AND DECLARATION—ELECTROMAGNETIC IMMUNITY			
The device is intended for use in the electromagnetic environment specified below. The customer or the user of device should assure that it is used in such an environment.			
IMMUNITY TEST	IEC 60601 TEST LEVEL	COMPLIANCE LEVEL	ELECTROMAGNETIC ENVIRONMENT – GUIDANCE
Proximity magnetic fields IEC 61000-4-39	65 A/m 134,2 kHz Pulse modulation 2,1 kHz	65 A/m 134,2 kHz Pulse modulation 2,1 kHz	/
	7,5 A/m 13,56 MHz Pulse modulation 50 kHz	7,5 A/m 13,56 MHz Pulse modulation 50 kHz	

TABLE EMC-5

Recommended separation distances between portable and mobile RF communications equipment and the device						
The device is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of devices can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the devices as recommended below, according to the maximum output power of the communications equipment. Portable and mobile radio communications equipment (e.g. two-way radio, cellular/ cordless telephones and similar equipment) should be used no closer to any part of this device, including cables, than determined according to the following method:						
Test frequency (MHz)	Band (MHz)	Service	Modulation	Maximum power (W)	Distance (m)	Immunity test level (V/m)
385	380 - 390	TETRA 400	Pulse modulation 18Hz	1.8	0.3	27
450	430 -470	GMRS 460 FRS 460	FM \pm 5 kHz deviation 1 kHz sine	2	0.3	28
710	704 - 787	LTE Band 13,17	Pulse modulation 217 Hz	0.2	0.3	9
745						
780						
810	800 - 960	GSM 800/900, tetra 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	2	0.3	28
870						
930						
1720	1700 - 1990	GSM 1800, CDMA 1900, GSM 1900, DECT, LTE Band 1, 3,4,25,UMTS	Pulse modulation 217 Hz	2	0.3	28
1845						
1970						
2450	2400 - 2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	2	0.3	28

5240	5100 - 5800	WLAN, 802.11 a/n	Pulse modulation 217 Hz	0.2	0.3	9
5500						
5785						

TABLE EMC-6

RECOMMENDED SEPARATION DISTANCE PORTABLE AND MOBILE RF, COMMUNICATION EQUIPMENT AND THE DEVICE				
The device is intended for use in an electromagnetic environment in which radiated RF disturbance are controlled. The customer or the user of device can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and device as recommended below, according to the maximum output power of the communication equipment.				
Rated Maximum Output power of Transmitter Watts (W)	Separation Distance According to Frequency of Transmitter (m)			
	150 kHz to 80 MHz $d = 1.2 \times \sqrt{p}$	150kHz to 80MHz in ISM bands $d = 1.2 \times \sqrt{p}$	80 MHz to 800 MHz $d = 1.2 \times \sqrt{p}$	800 MHz to 2.7 GHz $d = 2.3 \times \sqrt{p}$
0.01	0.12	0.12	0.12	0.23
0.1	0.38	0.64	0.38	0.73
1	1.2	2	1.2	2.3
10	3.8	6.4	3.8	7.3
100	12	20	12	23
For transmitters at a maximum output power not listed above, the recommended separation distanced in meters (m) can be determined 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: 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.				

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