



动物专用麻醉呼吸机 使用说明书

Veterinary Anesthesia Ventilator
User's Manual

型号/Model: VA-200



首先，感谢您选用深圳市谊业仪器有限公司（后面简称 谊业仪器）的VA-200动物专用麻醉呼吸机。在第一次安装和使用本产品之前，请您务必仔细阅读随机配送的所有资料，这会有助于您更好地使用本产品。

谊业仪器致力于不断改进产品功能、提高服务质量，保留对本手册中所描述的任何产品及本手册的内容进行更改而不预先另行通知的权利。

声明

谊业仪器保留不事先通知而修改本用户手册内容的权利。

谊业仪器保留不事先通知而变更技术的权利。

谊业仪器保留不事先通知而对产品规格进行修改的权利。

谊业仪器对于本资料不作任何形式的担保，包括（但不限于）为某种特定目的对其提出的暗含的适销性和适合性的保证责任。

谊业仪器仅在下列情况下才认为应对仪器的安全性、可靠性和性能负责，即：

装配操作、扩充、重调、改进和修理均由谊业仪器认可的人员进行；

有关的电气设备符合国家标准；

仪器按照操作指导进行使用。

若下列情况出现，谊业仪器不对产品的安全性、可靠性及运行状况负责：

组件被拆装、拉伸、重新调试；

非谊业仪器授权人员维修或改动仪器；

产品没有按照《用户手册》正确使用。

目录

Index

1. 简介.....	4
2. 系统安全.....	8
3. 开箱和组装.....	10
4. 操作指南.....	16
5. 清洁与保养.....	17
6. 保修.....	18
7. 产品服务.....	18
1. Introduction.....	19
2. System safety.....	24
3. Unpacking and assembly.....	27
4. Operation guide.....	32
5. Clean and maintenance.....	33
6. Warranty.....	34
7. Product Service.....	35

1. 简介

1.1 概述

首先感谢您选择谊业仪器出品的动物专用麻醉呼吸机！

在第一次安装和使用本产品之前，请您务必仔细阅读随机配送的所有资料，这会有助于您更好地使用本产品。

谊业仪器致力于不断改进产品功能、提高服务质量，保留对本手册中所描述的任何产品及本手册的内容进行更改而不预先另行通知的权利。

如果您在使用过程中发现本产品的实际情况与本手册有不一致之处，或您想得到最新的信息及任何问题和想法，欢迎垂询或登陆我公司网站 www.newtootoo.com。



本设备仅用于动物临床和科研使用，禁止用于人类！

1.2 安全性

用户在操作呼吸机时，涉及到可能存在的潜在危险物质，为避免在使用过程中对实验动物和操作人员造成伤害，以及对呼吸机的损坏，请仔细阅读“2-系统安全”章节。

如果您对安全性方面有任何疑问或建议，请联系本公司获得售后服务支持。



呼吸机请由经过培训的专业人员操作和管理！

1.3 产品特点

- 外观简洁大方，配色淡雅，布局紧凑，整体尺寸小巧，可配备呼麻一体机支架，操作方便、灵活；
- 配有机控模式和手动模式；
- 压力限制工作模式，保证安全；
- 潮气量设定，潮气量旋钮调节方向指示；
- 配备 300ml 和 1500ml 两个大小不同的风箱，适用于100kg以内的动物；
- 具有交流电掉电报警和电池欠压报警；
- 提供内部可充电电池供电，满电量可正常工作 4 小时左右。

1.4 设备主要部件介绍

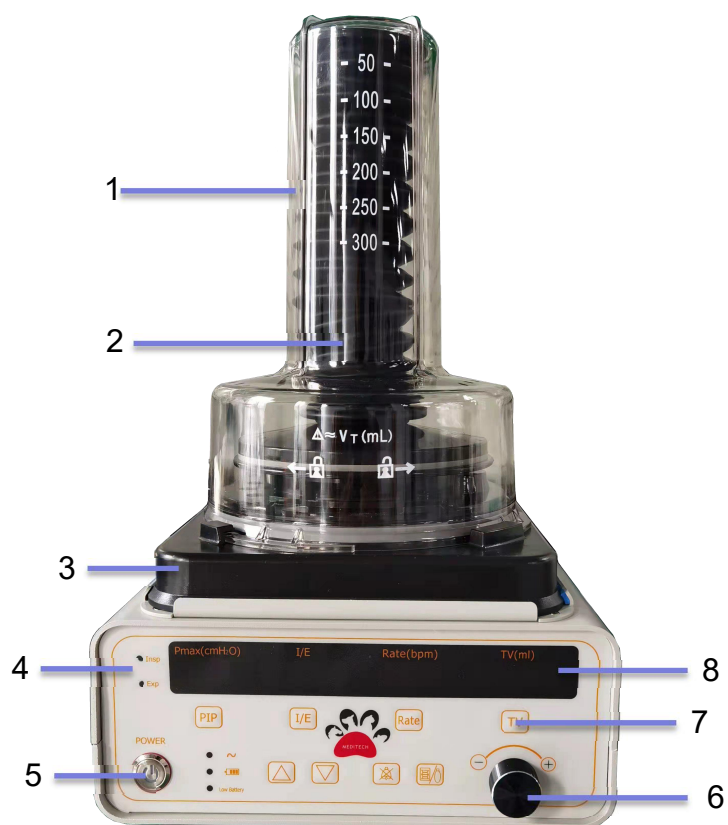
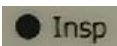
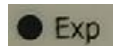
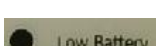


图 1 主机正面视图

编号	部件	描述
1	风箱组件	把外界气体和驱动气体隔离开
2	折叠囊	将新鲜氧气和麻醉气体输入至动物肺部
3	底座	连接主机和风箱
4	指示灯	指示设备运行状态，共有7个指示灯
5	电源开关	开启或关闭设备，按一下开启，电源灯亮，再按一下关闭，指示灯灭
6	潮气量调节旋钮	调节呼吸机吸气气流大小，顺时针增加，逆时针减少
7	按键	通过按键可以对呼吸机的参数进行调节
8	数码窗口	显示呼吸机的设置参数或监测潮气量

指示灯介绍

编号	图标	描述
1		吸气指示灯，吸气状态亮，呼气状态灭
2		呼气指示灯，呼气状态亮，吸气状态灭
3		交流电源指示，交流供电完好，指示灯亮；开机状态下，交流掉电，指示灯闪烁
4		电池状态指示，为双色指示，开路蓝色指示灯闪烁；充电蓝色指示灯常亮；电池供电绿色指示灯亮
5		电池欠压（ $<8.4V$ ）时，此指示灯闪烁
6		在潮气量设定模式时，若在限定时间内监测的潮气量超过了设定值，此指示灯会闪烁，提示逆时针旋转潮气量旋钮，减少潮气量
7		在潮气量设定模式时，若在限定时间内监测的潮气量没达到设定值，此指示灯会闪烁，提示顺时针旋转潮气量旋钮，增加潮气量

按键介绍

编号	图标	描述
1		吸气限压按键
2		吸呼比按键
3		呼吸频率按键
4		潮气量按键
5		参数增加按键
6		参数减少按键
7		静音按键
8		机控、手控切换按键

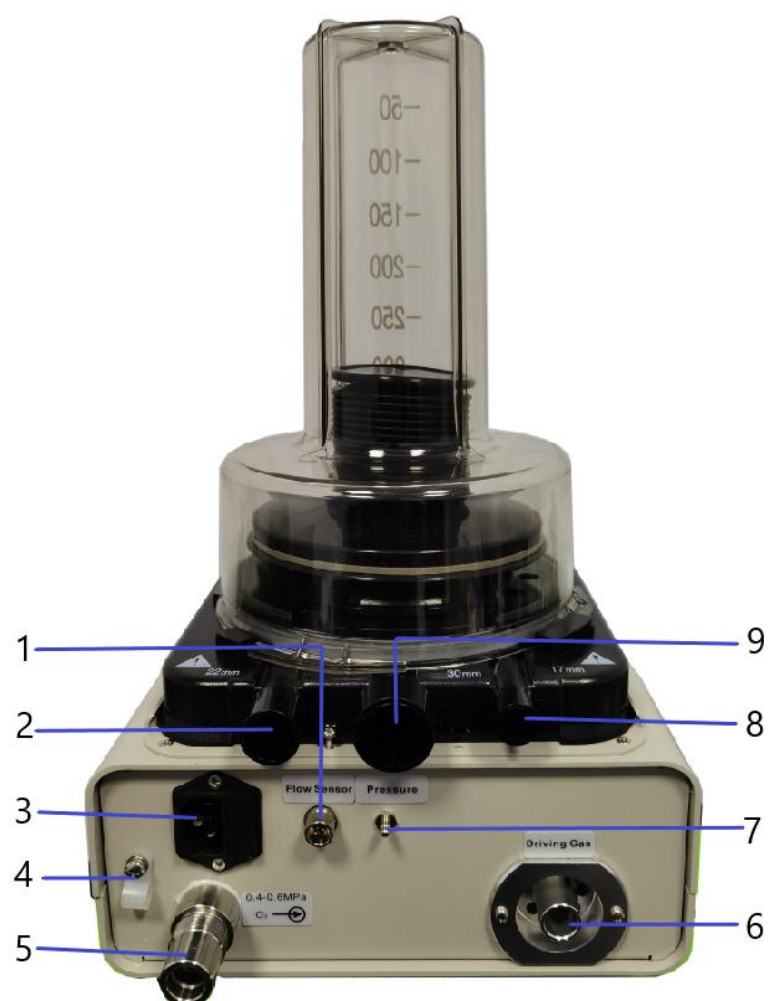


图 2 主机后面视图

编号	部件	描述
1	流量传感器接口	连接涡轮流量传感器，测量潮气量
2	新鲜气体端口	接麻醉机
3	电源接口	接入交流电源
4	电线固定卡	固定电源线，以防电源线脱落
5	气源端口	氧气气源（或者空气）

编号	部件	描述
6	驱动气体端口	接17mm端口
7	压力传感器端口	接22mm端口
8	17mm端口	接驱动气体端口
9	麻醉废气排放端口	接气体过滤罐

1.5 规格参数

参数项	规格
尺寸	253mm×224mm×112mm
重量	3.22kg
呼吸频率设定	2~120 bpm
吸呼比设定	3:1, 2:1, 1.5:1, 1:1, 1:1.5, 1:2, 1:3
吸气潮气量设定	100~1500ml
呼气潮气量监测	10~1500ml
气道压力峰值设定	5~60 cmH ₂ O
气道压力监测	0~99 cmH ₂ O
体重范围	≤100.0kg

2. 系统安全

2.1 安全说明

为安全起见，请务必注意以下事项：

- 请仔细阅读本用户手册。
- 本用户手册为设备不可分割的一部分，放于设备附近方便随时查阅。
- 呼吸机工作条件：
温度：0℃~40℃，
湿度：15%~95%（非冷凝），
大气压力：70kPa ~ 110kPa

- 呼吸机存储条件：
温度：-20℃～45℃，
湿度：≤95%，大气压力：
70kPa ~ 110kPa



警告：

高压氧气与可燃物质（润滑脂、机油、酒精等）相遇时，可能会导致爆炸性反应：

- 要使设备和所有接头绝对保持没有机油和润滑脂。
- 在操作氧气供应装置之前，务必保持双手清洁干净。
- 绝对禁止在呼吸机附近吸烟以及点燃明火。
- 安装和更换氧气瓶时，尽可能使用手来拧紧氧气瓶和减压阀上的所有接头，如需使用工具，切勿用力过猛，以防损坏螺纹和密封材料，从而导致气体泄漏。
- 请采取措施防止氧气瓶倾倒，如果氧气瓶翻倒在减压阀上，可能会将其压坏并引起爆炸。



重要：

- 始终要缓慢打开氧气瓶减压阀，以防止骤升的压力冲击呼吸机内部的阀门配件。
- 时刻检查氧气瓶的氧气压力，不要将其中的氧气完全用尽，否则周围环境中的潮湿空气可能会侵入并导致部件锈蚀。



注意：

- 在呼吸过程中必须对动物与呼吸设备进行不间断观察。
- 与麻醉机相互连接的呼吸回路需保证通畅并且易于观察，避免被覆盖或者会使其功能受到影响的（例如：动物的位置不当）。
- 开发设备软件时已采取了大量的质量保证措施，因软件缺陷而导致的风险微乎其微。
- 请采取措施防止橡胶与橡胶零件受到紫外光和长时间的阳光直射，以避免这些部件脆化。

2.2 警告信息和注意事项

- 在使用本设备对动物进行操作前，请使用者务必对本用户手册进行细致的阅读并完全理解其内容。
- 在使用本设备前，请仔细检查所有接口，确保气密性良好，无泄漏。
- 对设备进行任何不当的清洁、保养和操作而造成的设备故障，相应责任由用户承担。
- 若未经谊业仪器授权而擅自拆装设备主机，本公司将不再对该设备提供任何质量保证和技术维护服务承诺。如有技术问题请联系授权人员或者谊业仪器获得支持。



触电危险：禁止非专业人士将设备的盖板或面板取下以及拆卸内置充电电池。



危险：禁止使用易燃性、易爆性气体作为设备气源。

2.3 安全须知

本设备只限于具有呼吸麻醉相关知识或者经过厂家培训的人员使用。

设备应安装在远离水源、通风良好以及气压、温度、湿度相对恒定的场所，避免日光直射，并避免场所内含有腐蚀性、易燃易爆的气体 and 化学药品。在放置或搬运操作中，避免将设备处于倾斜、震动、挤压等危险状态！注意接入电源的电压电流值及频率值，并注意接地端是否正常。避免设备在超负荷的情况下运行！

警告！

禁止在呼吸循环中吸气阶段使用麻醉机上的快速充氧按钮。这样做会导致动物严重的肺部破裂。在吸气阶段，控制单元中的排泄阀是关闭的，所以充氧气流会加入到呼吸机的送气气流中，而此时气流唯一的去向就是实验动物的肺部。

2.4 质保信息

- 本设备质保从出厂之日算起，期间因材料、工艺缺陷等问题造成设备无法正常使用，本公司承担设备维护、部件更换等售后服务。
- 任何不正确的使用或超范围使用造成的设备损坏，不在质保范围内，若需要进行维修或部件更换，所产生的费用由用户承担。
- 若返修设备到达后，经检查发现未经谊业仪器授权而擅自拆开过，本公司不提供质保、免费维修和部件更换等售后服务。
- 本质保声明（包括其限制条件）由谊业仪器独家发布，覆盖所有的其它质保条件。

3. 开箱和组装

- 1) 开箱前，请仔细检查外包装，如果发现有破损、撞伤等情况发生，请尽快与供应商联系，待确认后，方可进行下一步操作；
- 2) 将所有货物从装运箱中取出，并妥善保留原始包装，以备日后运输使用；
- 3) 请按随货装箱清单明细（如下）逐个清点物料，检查发货物料和数量是否与合同订单一致，并认真检查物料，若有破损、撞伤等情况，请尽快与供应商联系。

装箱清单明细：

主机	1 台
300ml 风箱和风箱罩	1 套
1500 ml 风箱和风箱罩	1 套
0.8 m 22mm波纹管	1 根
(用途：用于连接麻醉机和呼吸机，可以使用蒸汽灭菌)	
0.5m 17mm可再用螺纹管	1 根
(用途：用于连接风箱和呼吸机，可以使用蒸汽灭菌)	
气道压连接管-鲁尔-22mm 接头	1 个
涡流流量传感器	1 个
电源线	1 根
质保卡	1 张
用户使用说明书	1 份

注意：如果您的订单中包含其他小配件，也可能会同时装箱运送，请参考货运单。

3.1 使用须知

在使用本设备前，请务必仔细阅读本用户手册！

本设备设计用于执行本手册中提到的功能，请根据手册中的相应说明进行使用及操作。本设备必须定期进行检查维护，以确保设备的可靠运行。

如果任何组件发生以下情况：局部或整体破损、磨损过度、受到污染或其它原因导致其使用寿命终结，则应该停止使用，并采用本公司或经本公司授权企业生产的配件进行更换。

无法正常工作的设备应该立即停止使用，用户不得对本设备进行任何形式的改动。若由于不按照本公司授权的维护说明进行操作，或对本设备及其配件进行未经授权的维修或改进，或使用已损毁的配件或是未经授权的配件设备，给受试动物造成伤害或对财产（包括设备本身）造成损失，责任由用户自行承担。

3.2 安装

- 检查控制主机是否完好，并检查后面板的所有接口，确保供气口（SUPPLY GAS）、驱动气体端口（DRIVING GAS）以及排气口（EXHAUST）未堵塞；
- 检查风箱和风箱罩是否完好，并检查风箱内部没有任何杂物；
- 安装风箱和风箱罩。将风箱最下方的波纹套套在控制主机的装配环上，轻轻手持风箱圆盘的外边缘（风箱顶端），迅速提起并放下，重复几次，以理顺风箱上的波纹。然后将风箱罩盖在风箱上，并轻轻按下，顺时针旋转风箱罩直至其正确卡在底座的卡销中，至此，风箱和风箱罩安装完成。



图3

- 连接涡轮流量传感器。把涡轮流量传感器的插头插入流量传感器接口

(FlowSensor)，如图4所示。



图4

- 安装呼吸回路端口。将气道压连接管-鲁尔-22mm 接头旁侧的气道压连接管（鲁尔接头） 连接到控制单元的压力传感器端口（Pressure），然后将 22mm接头（透明）安装于风箱底座的 22mm 端口上；如下图5所示。



图 5

- 连接驱动气体管路。使用橡胶助力管连接风箱底座的 17mm 端口与控制单元上的驱动气体端口（DRIVING GAS）；如下图6所示。



图6

- 连接供气系统。用氧气管和三通阀连接氧气气瓶泄压阀（气体输出压力必须处于0.2~0.4MPa之间）与控制主机上的气源端口（SUPPLY GAS），先插进去再顺时针旋转到底。如下图7所示。



图 7

- 电源线连接：先把电源线的品字头端插到机器的电源接口，再用电缆固定卡，把电源线固定在机器上，防止脱落，电源线的另一端插入电源插座。如下图8所示。



图 8

- 连接呼吸机与麻醉系统。将麻醉机上的呼吸袋取下，用螺纹管将风箱底座上的 22mm 端口和麻醉机的呼吸袋接口连接起来；如下图9所示。

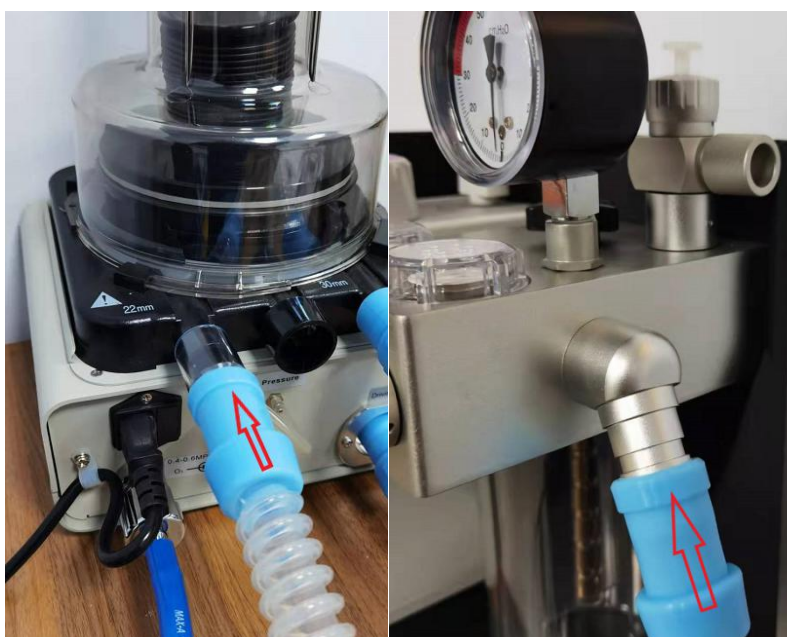


图9

- 安装涡轮流量传感器。

首先要确定最小潮气量大小，若大于100mL，建议将涡轮流量传感器安装在吸气管路上，如下图10左侧所示；小于100ml，简易安装在呼气管路上，如下图10右侧所示。

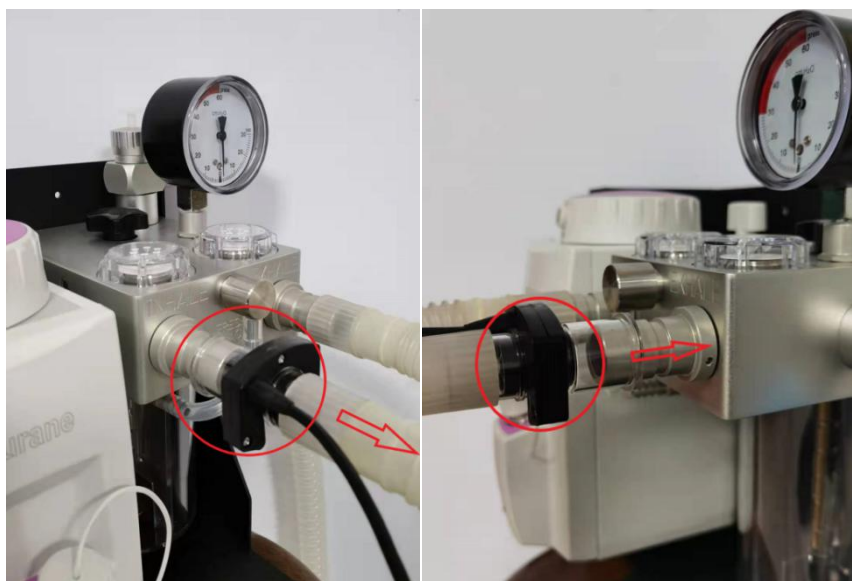


图 10

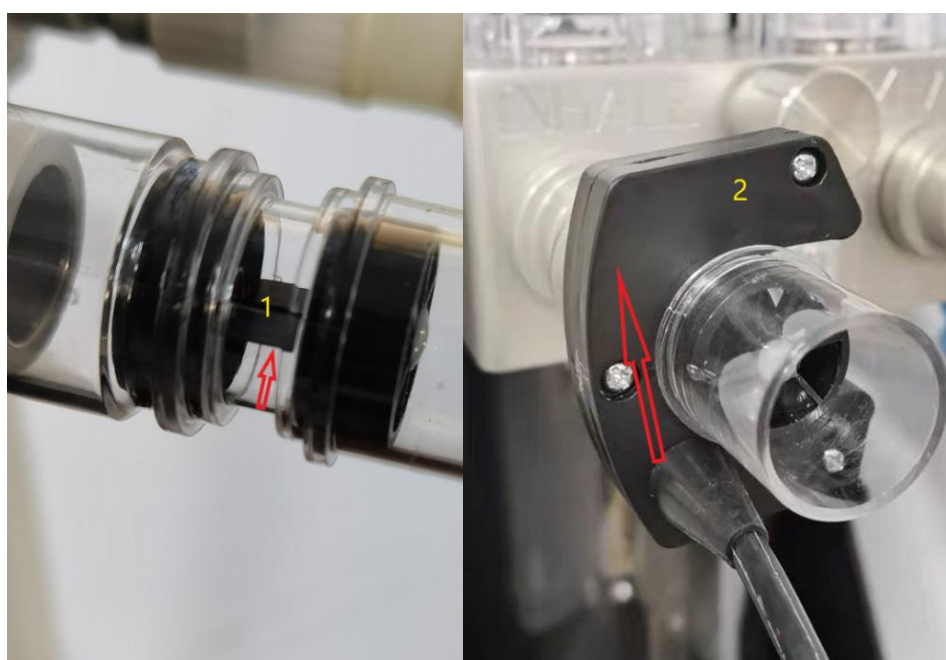


图11

⚠ 注意：如上图11所示，涡轮传感器有两部分组成，左侧图示1涡轮部分和右侧图示2检测器部分。在安装时让涡轮转动等停止下来后，涡轮片处于自由静止状态，安装检测器部分时，要保证检测器的方向（右图箭头方向）与涡轮片方向（左图箭头方向）相互垂直，这样才能减少扰动，保证测量结果正确。

4. 操作指南

4.1 开机

轻轻按压电源开关（不要太用力，容易损坏电源开关），机器上电，数码显示窗口全显示“8”，所有指示灯亮，3秒后进入正常工作状态，数码窗口显示设置好的参数，呼吸机开始工作。

4.2 参数调整

按压需要调节参数的按键，对应参数的数码窗口显示内容闪烁，然后按压“”参数增大，按压“”参数减小，若一直按“”或“”，参数会快速增大或减小，达到所需要的数值后，再次按压调节参数的按键，数码窗口停止闪烁，机器开始按照新的参数开始工作。

4.3 模式切换

按压“”，可以在机控模式和手动模式之间进行切换，机控模式是“IE”窗口正常显示吸呼比参数，手动模式时，“IE”窗口显示“C C C C”。

 **注意：**涡流流量传感器可以安装在吸气管路或呼气管路，安装在吸气管路上时，潮气量需要调节到100ml以上；安装在呼气管路上时，需要调节潮气量100ml以下，潮气量窗口显示“C C C C”。这个一定要对应好，不然会引起呼吸机潮气量监测错误。

4.4 报警和静音操作

当交流电突然断电或电池欠压时，机器会发出声音报警。交流电掉电时，交流指示灯“ ~”会闪烁；电池欠压时，电池欠压指示灯“ Low Battery”会闪烁。

当机器发出报警声音后，按压“”键，机器静音，若是交流电掉电报警，机器不会再发出声音报警，除非交流电重新上电后再次掉电；若是电池欠压报警，2分钟后会再次发出声音报警。

4.5 工作状态说明

- 机控模式下，机器按照设定的频率和吸呼比送气，吸气时间和呼气时间都是按照设定参数来执行，但当气道压力达到设定的“PIP”压力时，机器会立刻转向呼气，进行压力保护。
- 若涡轮流量传感器安装在吸气管路，当吸气潮气量达到了设定潮气量时停止吸气转向呼气，若此时吸气时间不足设定吸气时间的80%，指示灯“”会闪烁，提升减小吸气流速；若超过设定吸气时间的120%仍然没有达到设定潮气量，机器也会停止吸气转向呼气，指示灯“”会闪烁，提示增加吸气流速。
- “PIP”窗口：吸气状态，窗口显示内容会随着气道压力的上升而动态增大，达到峰压后，会显示峰压0.5秒，然后显示压力下降，最后显示呼气末压力。

- “TV”窗口：若涡轮流量传感器安装在吸气管路，吸气时显示吸入的潮气量，并显示最大的吸入潮气量；若涡轮流量传感器安装在呼气管路，呼气时显示呼出的潮气量，并显示最大的呼出潮气量。

5. 清洁与保养

5.1 产品清洁

本呼吸机的绝大部分都不与呼吸气体直接接触，因此，仅需要使用干布进行清洁。**呼吸机表面的清洗：**呼吸机表面可以用干净、柔软、稍微沾湿的布进行擦拭。可以用中性的清洗剂去除顽垢污渍。



只能使用水与中性清洁剂对风箱及风箱罩进行清洗，使用软布进行擦拭，不能使用粗糙的布或者是有味道的清洗剂。千万注意不能使用乙醇进行清洗。

风箱罩的清洗：将风箱罩逆时针旋转，至卡扣彻底露出（由于密封圈的作用，这个步骤需要施加较大外力），垂直方向将风箱罩提起。由于风箱罩不与呼吸气体直接接触，因此只需要用干净的稍微沾湿的布擦拭，或者用中性清洗剂浸泡并用清水冲洗。**不能使用高温蒸汽消毒波纹管罩**，高温蒸汽会导致风箱罩发生变形，无法正常使用。**不能使用乙醇进行清洗。**

5.2 电池维护

5.2.1 电池性能维护

电池使用过程中，应定期进行优化以维持其使用寿命。建议每存储3个月，对电池进行一次维护。请参照以下步骤进行：

- 1) 将设备取出，在室温5℃~30℃环境下，稳定2小时以上；
- 2) 接通外部电源，对电池充电6~8小时；
- 3) 重新放置好设备。

5.2.2 检查电池性能

电池的性能可能会随着使用时间的增加而下降。正常情况下，电池充满电的续航时间为4h，如果电池供电时间明显低于4h，考虑更换电池或联系售后人员。

注意：电池的使用寿命取决于使用的频率与时间，如果对电池的维护和存储适当，锂电池的寿命大概为3年。如果不正当使用电池，其寿命可能更短。我们推荐对锂电池每3年更换一次。

5.3 电池回收

如果电池有明显的损坏，或者电池容量耗尽时，应进行更换，并将其正确的回收。处理废旧电池时，应遵循相应的法规。

警告！

请勿拆卸电池，或投入火中，或将其短路。电池燃烧、爆炸、泄漏将可能造成人身伤害。

6. 保修

保修只适用于从谊业仪器公司直接购买或者从谊业仪器授权的经销商处购买的新产品，以及由此延伸到的第一位购买者。

从第一个买家或买家订单交付之日算起的1年的时间内，原厂保修麻醉机在材料和工艺上的功能缺陷，并遵从在操作指导书、维护手册、相应的标签和插页的产品描述，在相同操作条件下的正常使用过程中，按照指示定期进行维护、更换和维修。

如果产品被谊业仪器公司之外的机构维修或者服务，或者与谊业仪器公司所提供的说明不一致，或者被谊业仪器公司之外的机构更改，或者产品被滥用、失误使用而造成的问题，谊业仪器公司将不会接受前面所提到的任何保修申请。谊业仪器公司不对任何偶然的损伤、间接损伤、特殊操作等不正当使用仪器而产生的损伤负责。

7. 产品服务

如果您有任何问题 请和我们保持联系

售后服务单位:

深圳市谊业仪器有限公司

地址：中国深圳市龙岗区海航城商务中心607室

售后服务电话：+86-755-28306385

电话：+86-755-28306385

传真：+86-755-28306385

邮箱：info@newtooo.com

First, thanks for using the Veterinary Anesthesia Ventilator VA-200, It is important that you carefully read all profiles from the randomized distribution before installing and using the product for the first time, which will help you to use the product better.

TooToo MediTech Co., Ltd . is committed to continuously improving product functions and improving service quality, and reserves the right to make changes to any product described in this manual and the content of this manual without prior notice.

Declaration:

TooToo reserves the right to modify the content of this user manual without prior notice.

Reserves the right to change the technology without prior notice.

Reserves the right to modify product specifications without prior notice.

Does not guarantee this material in any form, including (but not limited to) its implied merchantability and suitability guarantee for a specific purpose.

TooToo considers responsible for the safety, reliability and performance of the instrument only under the following circumstances:

The assembly operation, expansion, re-adjustment, improvement and repair are all carried out by personnel approved by TooToo;

The relevant electrical equipment complies with national standards;

The machine is used in accordance with the operating instructions.

If the following situations occur, TooToo is not responsible for the safety, reliability and operating conditions of the products:

The components are disassembled, stretched, and re-commissioned;

Repair or alter the equipment by non-Defy medical authorized personnel;

The product is not used correctly in accordance with the "User Manual".

1. Introduction

1.1 Summary

First of all, thanks for choosing the veterinary anesthesia ventilator produced by TooToo!

Before installing and using this product for the first time, please be sure to read all the materials shipped with it carefully, which will help you to use this product better.

TooToo is committed to continuously improving product functions and improving service quality, and reserves the right to make changes to any product described in this manual and the content of this manual without prior notice.

If you find that the actual situation of this product is inconsistent with this manual during use, or you want to get the latest information and any questions and ideas, please inquire or visit our company's website www.newtootoo.com.



This machine is only used for animal clinical and scientific research, and it is forbidden to be used for humans!

1.2 Safety

When the user operates the ventilator, it involves potentially dangerous substances that may exist. In order to avoid injury to lab animals and operators during use, as well as damage to the ventilator, please read carefully the "2-System Safety" chapter.

If you have any questions or suggestions on safety, please contact our company for after-sales service support.



The ventilator should be operated and managed by trained professionals!

1.3 Product feature:

- The machine has the characteristics of simple and generous appearance, elegant color matching, compact layout, and small overall size. It can be equipped with a anesthesia machine stand, which is convenient and flexible to operate;
- With machine-control mode and manual mode;
- Pressure limited working mode to ensure safety;
- Tidal volume setting, knob adjustment direction indicator;
- Equipped with two bellows of different sizes, 300ml and 1500ml, suitable for animals within 100kg;
- With AC power failure alarm and battery undervoltage alarm.
- Provides internal rechargeable battery power supply, full power can work normally for about 4 hours

1.4 Introduction to the main components of the ventilator

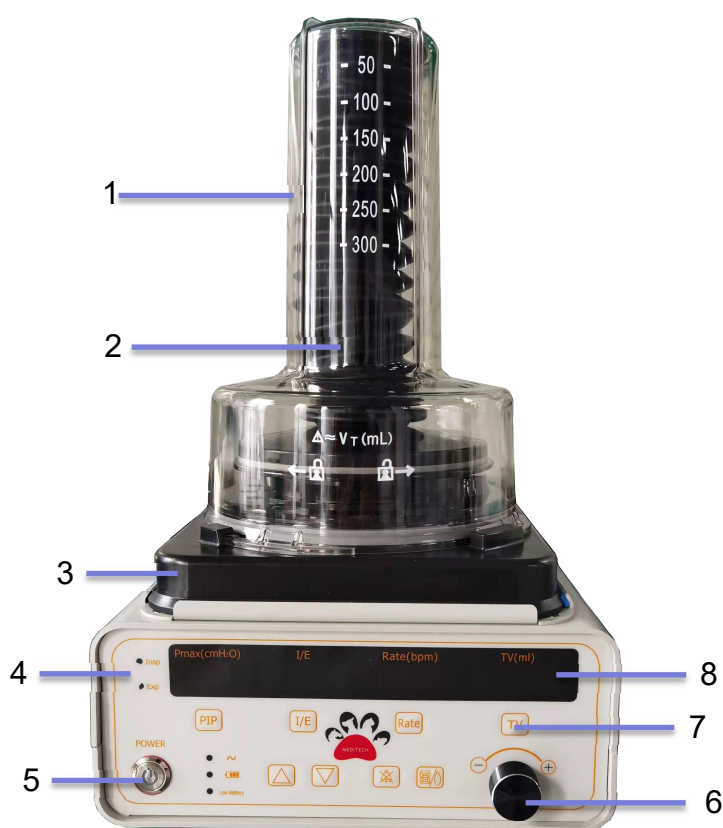
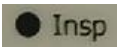
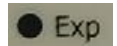
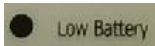


Figure 1 Front view of the ventilator

	Component	Description
1	Bellows components	Separate the outside gas from the driving gas
2	Folded bag	Deliver fresh oxygen and anesthetic gas to animal lungs
3	Bellow base	Connect the unit and the bellows
4	Indicator light	Indicate the operating status of the machine, a total of 7 indicator lights
5	Switch	Turn the device on or off, click to turn on, the power light is on, press again to turn off, the light is off
6	Tidal volume adjustment knob	Adjust the size of the inspiratory airflow of the ventilator, increasing clockwise and decreasing counterclockwise
7	Button	The parameters of the ventilator can be adjusted by pressing the buttons

	Component	Description
8	Digital display window	Display the setting parameters of the ventilator or monitor the tidal volume

Introduction of indicator lights

	Mark	Description
1		Inhalation indicator light, inspiratory state is on, exhalation state is off
2		Exhalation indicator light, the exhalation state is on, and the inhalation state is off
3		AC power indication, the AC power supply is intact, the indicator light is on; when the power is on, the indicator light flashes when the AC power is off
4		The battery status indicator is a two-color indicator, the open blue indicator light flashes; the charging blue indicator light is always on; the battery power supply green indicator light is on
5		When the battery is undervoltage (<8.4V), this indicator flashes
6		When setting tidal volume, if the monitored tidal volume exceeds the set value within a limited time, this indicator will flash, prompting you to turn the tidal volume knob counterclockwise to reduce the tidal volume
7		When setting tidal volume, if the monitored tidal volume does not reach the set value within a limited time, this indicator will flash, prompting you to turn the tidal volume knob clockwise to increase the tidal volume

Introduction of buttons

	Mark	Description
1		Inspiratory pressure limiting button
2		Inhale and exhale ratio buttons
3		Breath rate button
4		Tidal volume button
5		Increase parameter button
6		Decrease parameter key
7		Mute button
8		Machine-control, manual switch button

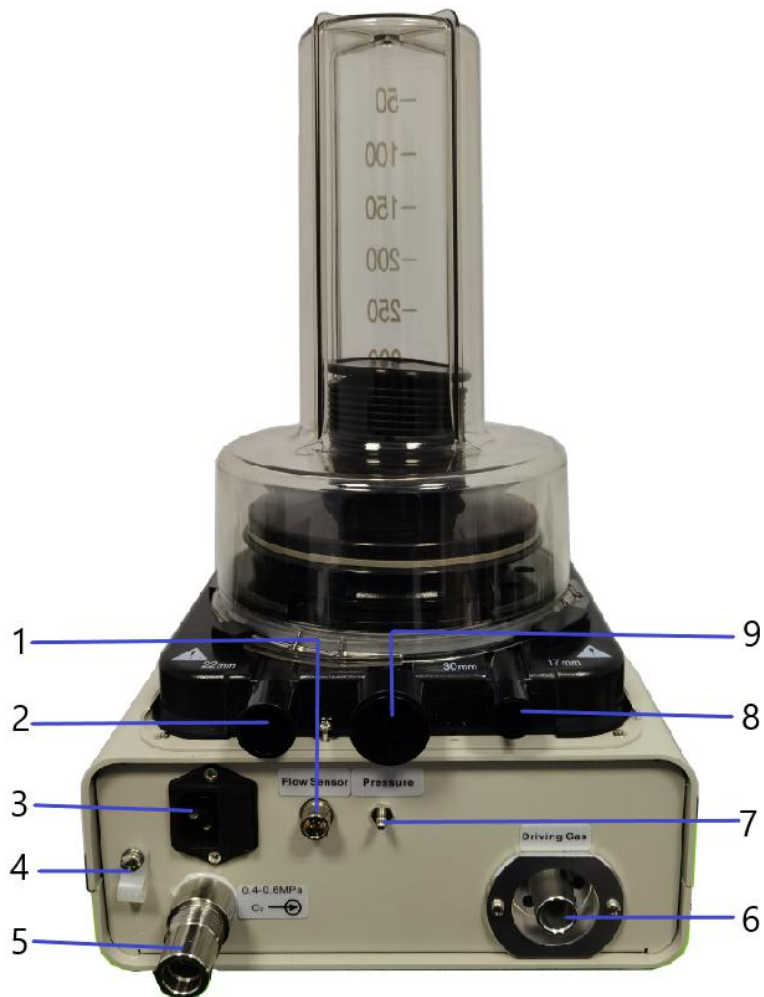


Figure 2 Back view of the ventilator

	Component	Description
1	Flow sensor interface	Connect the turbine flow sensor to measure the tidal volume
2	Fresh gas interface	Connect to the anesthesia machine
3	Power interface	Connect to AC power
4	Wire fixing slot	Fix the power cord to prevent it from falling off
5	Gas source interface	Oxygen gas source (or air)
6	Drive gas interface	Connect to 17mm interface

	Component	Description
7	Pressure sensor interface	Connect to 22mm interface
8	17mm interface	Connect to the drive gas interface
9	Anesthetic waste gas exhaust interface	Connect to the gas filter tank

1.5 Specifications

Parameter item	Specification
size	253mm×224mm×112mm
weight	3.22kg
Breath rate setting	2~120 bpm
Inhalation and expiration ratio setting	3:1, 2: 1, 1.5: 1, 1: 1, 1: 1.5, 1: 2, 1: 3
Inspiratory tidal volume setting	100~1500ml
Exhalation Tidal volume monitoring	10~1500ml
Airway pressure peak setting	5~60 cmH ₂ O
Airway pressure monitoring	0~99 cmH ₂ O
Animal weight range	≤100.0kg

2. System safety

2.1 Safety instructions

For safety, please pay attention to the following:

- Please read this user manual carefully.
- This user manual is an integral part of the equipment, and it is easy to refer to at any time when placed near the equipment.
- Ventilator working conditions:
Temperature: 0℃~40℃,

Humidity: 15%~95% (Non-condensing) ,
Atmospheric pressure: 70kPa ~ 110kPa
70kPa ~ 110kPa



Warning:

When high-pressure oxygen meets combustible substances (grease, oil, alcohol, etc.), it may cause an explosive reaction:

- Keep the equipment and all joints absolutely free of oil and grease
- Before operating the oxygen supply device, be sure to keep your hands clean.
- It is absolutely forbidden to smoke and light open flames near the ventilator.
- When installing and replacing the oxygen cylinder, use your hands as much as possible to tighten all the joints on the oxygen cylinder and the pressure reducing valve. If you need to use tools, do not use excessive force to prevent damage to the threads and sealing materials, which may cause gas leakage.
- Please take measures to prevent the oxygen cylinder from tipping over. If the oxygen cylinder falls on the pressure reducing valve, it may be crushed and cause an explosion.



Attention:

- Always open the oxygen cylinder pressure reducing valve slowly to prevent the surge of pressure from impacting the valve fittings inside the ventilator.
- Always check the oxygen pressure of the oxygen cylinder, do not use up the oxygen completely, otherwise the humid air in the surrounding environment may invade and cause the parts to rust.



Attention:

- The animals and ventilator must be continuously observed during breathing.
- The breathing circuit connected to the anesthesia machine must be unobstructed and easy to observe, and avoid operations that are covered or that may affect its function (for example, the position of the animal is improper).
- A large number of quality assurance measures have been taken when developing equipment software, and the risks caused by software defects are minimal.
- Please take measures to prevent the rubber and rubber parts from being exposed to ultraviolet light and long-term direct sunlight to avoid embrittlement of these parts.

2.2 Warning information and precautions

- Before using this ventilator to operate animals, users must read this user manual carefully and fully understand its content.
- Before using this ventilator, please check all interfaces carefully to ensure that the air tightness is good and there is no leakage.

- The user shall be responsible for the equipment failure caused by any improper cleaning, maintenance and operation of the equipment.
- If disassemble the main unit of the device without authorization from TooToo, the company will no longer provide any quality assurance and technical maintenance service commitments for the device. If you have any technical problems, please contact authorized personnel or TooToo for support.

 **Risk of electric shock:** Non-professionals are forbidden to remove the cover or panel of the device and disassemble the built-in rechargeable battery.

 **Danger:** It is forbidden to use flammable and explosive gas as the equipment gas source.

2.3 Safety notice

This machine is limited to personnel who have knowledge about respiratory anesthesia or who have been trained by the manufacturer.

The equipment should be installed in a place far away from water sources, well ventilated, and relatively constant air pressure, temperature, and humidity, avoid direct sunlight, and avoid corrosive, flammable and explosive gases and chemicals in the place. During placement or transportation, avoid tilting, vibrating, or squeezing the equipment! Pay attention to the voltage, current and frequency of the power supply, and pay attention to whether the grounding terminal is normal. Avoid running the equipment under overload conditions

Warning!

It is forbidden to use the rapid oxygenation button on the anesthesia machine during the inhalation phase of the breathing cycle. It can cause severe rupture of the animal's lungs. In the inhalation phase, the drain valve in the control unit is closed, so the oxygen-filled flow will be added to the aspiration flow of the ventilator, and the only destination of the flow is the lungs of the experimental animal.

2.4 Warranty Information

- The warranty of this equipment starts from the date of leaving the factory. the equipment cannot be used normally due to defects in materials and workmanship. The company is responsible for after-sales service such as equipment maintenance and component replacement.
- Any damage to the equipment caused by incorrect use or over-range use is not covered by the warranty. If repairs or parts replacement are required, the costs incurred shall be borne by the user.
- If the repaired equipment arrives, it is found after inspection that it has been disassembled without the authorization of TooToo, the company does not provide after-sales service such as warranty, free maintenance and parts replacement.
- The warranty statement (including its restrictions) is exclusively issued by TooToo, covering all other warranty conditions.

3. Unpacking and assembly

- 1) Before unpacking, please check the outer packaging carefully. If you find any damage, bumps, etc., please contact the supplier as soon as possible. After confirmation, you can proceed to the next step;
- 2) Take all the goods out of the shipping box, and properly keep the original packaging for future transportation;
- 3) Please count the materials one by one according to the packing list details (below), check whether the delivered materials and quantity are consistent with the contract order, and carefully check the materials. If there is damage, bumps, etc., please contact the supplier as soon as possible.

Packing list details:

Main Unit ----- 1

300ml bellow and its cover ----- 1

1500 ml bellow and its cover ----- 1

0.8 m 22mm pipeline ----- 1

(Purpose: Used to connect anesthesia machine and ventilator,can use steam sterilization)

0.5m 17mmReusable threaded tube ----- 1

(Purpose: Used to connect the air box and the ventilator, and can be steam sterilized)

airway pressure connecting tube-22mm -----1

Turbine flow sensor ----- 1

power cable ----- 1

Warranty card ----- 1

User Manual ----- 1

Attention : If your order contains other small accessories, they may also be packed and shipped at the same time, please refer to the freight bill.

3.1 Usage notice

Before using this equipment, please read this user manual carefully!

This equipment is designed to perform the functions mentioned in this manual. please use and operate according to the corresponding instructions in the manual.

This equipment must be regularly inspected and maintained to ensure the reliable operation of the equipment.

If any component has the following conditions: partial or overall damage, excessive wear, contamination or other reasons, which lead to the end of its service life, it should stop using it and replace it with accessories produced by our company or an enterprise authorized by our company.

Equipment that cannot work normally should be stopped immediately, and users are not allowed to modify the equipment in any form. If you do not follow the maintenance instructions authorized by the company, or perform unauthorized repairs or improvements on the equipment and its accessories, or use damaged accessories or unauthorized accessories and equipment, causing injury or Any damage to property (including the equipment itself) shall be borne by the user.

3.2 Installing

Check whether the control unit is in good condition, and check all interfaces on the rear panel to ensure that the air supply port (SUPPLY GAS), driving gas port (DRIVING GAS) and exhaust port (EXHAUST) are not blocked;

Check whether the bellows and bellows cover are intact, and check that there is no sundries inside the bellows;

Install the bellows and bellows cover. Put the bottom corrugated sleeve of the bellows on the assembly ring of the control host, gently hold the outer edge of the bellows disc (top of the bellows), quickly lift and put it down, repeat several times to smooth out the ripples on the bellows. Then put the bellows cover on the bellows and press it down gently, and turn the bellows cover clockwise until it is correctly locked in the bayonet of the base. At this point, the installation of the bellows and the bellows cover is completed.



Figure 3

Connect the turbine flow sensor. Insert the plug of the turbine flow sensor into the flow sensor interface (FlowSensor), as shown in Figure 4.



Figure 4

Install the breathing circuit port. Connect the airway pressure connecting tube-the airway pressure connecting tube (Luer connector) beside the Luer-22mm connector to the pressure sensor port (Pressure) of the control unit, and then install the 22mm connector (transparent) on the 22mm of the bellows base On the port; as shown in

Figure 5 below.



Figure 5

Connect the driving gas pipeline. Use a rubber booster tube to connect the 17mm port of the bellows base to the driving gas port on the control unit; as shown in Figure 6 below.



Figure 6

Connect the gas supply system. Connect the oxygen cylinder pressure relief valve (gas output pressure must be between 0.2~0.4MPa) and the gas source port (SUPPLY GAS) on the control host with an oxygen pipe and a three-way valve, insert it first, and then turn it clockwise to the end. As shown in Figure 7 below.



Figure 7

Power cord connection: First insert the end of the power cord into the power interface of the machine, and then use the cable fixing card to fix the power cord on the machine to prevent it from falling off. Insert the other end of the power cord into the power socket. As shown in Figure 8 below.



Figure 8

Connect the ventilator and anesthesia system. Remove the breathing bag from the anesthesia machine, and connect the 22mm port on the base of the bellows with the breathing bag interface of the anesthesia machine with a threaded tube; as shown in Figure 9 below.

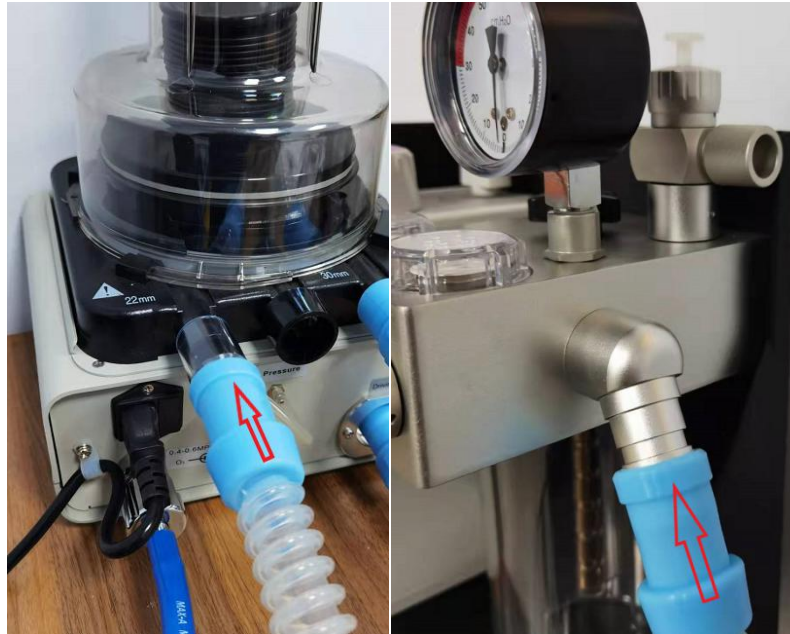


Figure 9

Install turbine flow sensor.

First, determine the minimum tidal volume. If it is greater than 100mL, it is recommended to install the turbo flow sensor on the inspiratory line, as shown on the left side of Figure 10; if it is less than 100ml, install it on the expiratory line, as shown on the right of Figure 10 below.

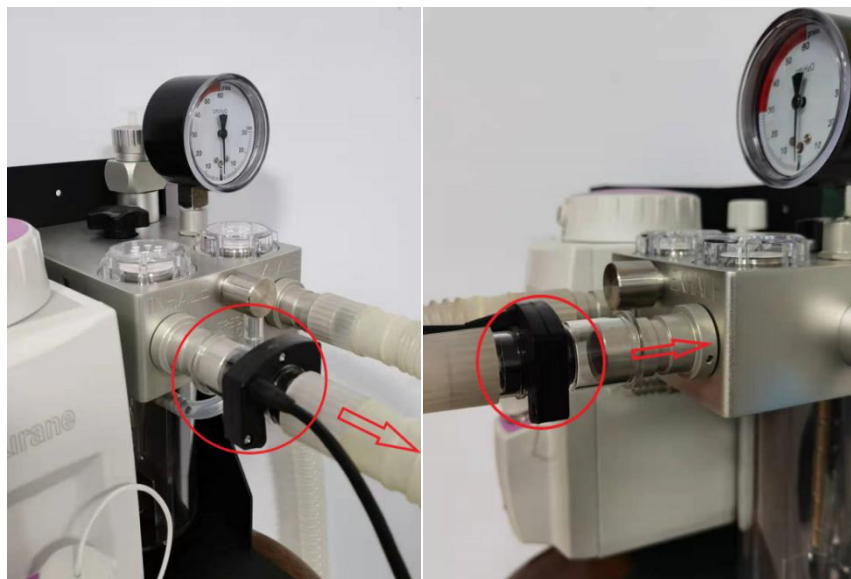


Figure 10

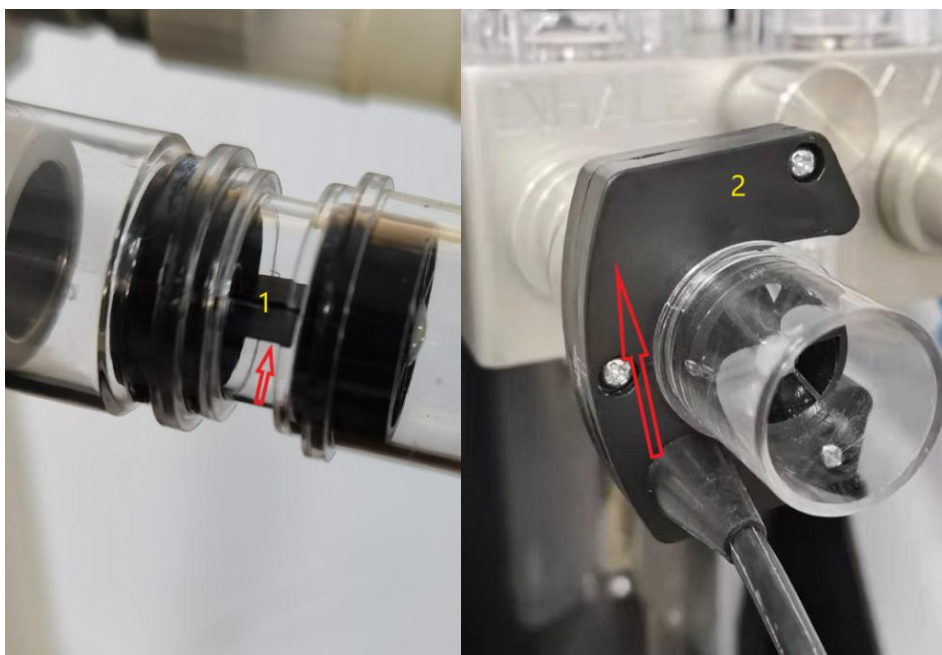


Figure 11

⚠ Attention: As shown in Figure 11 above, the turbine sensor consists of two parts, the left side shows the 1 turbine part and the right side shows the 2 detector part. After the turbine is stopped during installation, the turbine blade is in a free and stationary state. When installing the detector part, ensure that the direction of the detector (arrow direction in the right picture) and the direction of the turbine blade (arrow direction in the left picture) are perpendicular to each other. In order to reduce the disturbance and ensure the correct measurement results.

4. Operation guide

4.1 Turn on

Gently press the power switch (not too hard, it is easy to damage the power switch), the machine is powered on, the digital display window displays "8", all the indicators are on, and it enters the normal working state after 3 seconds, the digital window displays the set parameters, breathe The machine starts to work.

4.2 Parameter adjustment

Press the button that needs to adjust the parameter, the digital window of the corresponding parameter flashes, then press "" to increase the parameter, press "" to decrease the parameter, if you keep pressing "" or "", the parameter will increase or decrease rapidly After reaching the required value, press the button to adjust the parameter again, the digital window stops flashing, and the machine starts to work according to the new parameter.

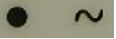
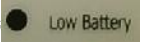
4.3 Mode switch

Press "" to switch between machine control mode and manual mode. In machine control mode, the "IE" window normally displays the respiratory ratio parameters. In manual mode, the "IE" window displays "C C C C".



Attention: The turbine flow sensor can be installed on the inspiratory or expiratory line. When installed on the inspiratory line, the tidal volume needs to be adjusted to more than 100ml; when installed on the expiratory line, the tidal volume needs to be adjusted below 100ml, the tidal volume window "CCCC" is displayed. This must be done well, otherwise it will cause errors in the tidal volume monitoring of the ventilator.

4.4 Alarm and mute operation

When the AC power is suddenly cut off or the battery is under-voltage, the machine will sound an alarm. When the AC power fails, the AC indicator " " will flash; when the battery is under-voltage, the battery under-voltage indicator " " will flash.

When the machine emits an alarm sound, press the " " key to mute the machine. If the AC power failure alarm, the machine will not sound the alarm again, unless the AC power is re-powered and then the power is off again; if the battery is under-voltage alarm, it will be activated after 2 minutes Sound the audible alarm again.

4.5 Work status description

In the machine control mode, the frequency and inspiratory-expiratory ratio set by the machine are delivered according to the set parameters. However, when the airway pressure reaches the set "PIP" pressure, The machine will immediately turn to exhale for pressure protection.

If the turbine flow sensor is installed in the inspiratory pipeline, when the inspiratory tidal volume reaches the set tidal volume, the inhalation will be stopped and the inhalation will be switched to exhalation. If the inspiratory time is less than 80% of the set inspiratory time, the indicator light " " will flash, increase and decrease the inspiratory flow rate;

If the set tidal volume is not reached after 120% of the set inhalation time, the machine will stop inhaling and turn to exhalation, and the indicator light " " will flash, prompting to increase the inspiratory flow rate.

"PIP" window: Inhalation status, the display content of the window will dynamically increase with the increase of airway pressure. After reaching the peak pressure, the peak pressure will be displayed for 0.5 seconds, then the pressure will drop, and finally the end-expiratory pressure will be displayed.

"TV" window: If the turbine flow sensor is installed in the inhalation line, the inhaled tidal volume will be displayed during inhalation, and the maximum inhaled tidal volume will be displayed; if the turbo flow sensor is installed in the expiratory line, it will display the exhaled volume during exhalation. The tidal volume is displayed, and the maximum expiratory tidal volume is displayed.

5. Clean and maintain

5.1 Product cleaning

Most of the ventilator is not in direct contact with breathing gas, therefore, it only

needs to be cleaned with a dry cloth. Cleaning the surface of the ventilator: The surface of the ventilator can be wiped with a clean, soft, slightly damp cloth. You can use a neutral cleaning agent to remove stubborn dirt and stains.



Warning: Only use water and neutral detergent to clean the bellows and bellows cover, use a soft cloth to wipe, not rough cloth or smelly detergent. Be careful not to use ethanol for cleaning. Cleaning of the bellows cover: Rotate the bellows cover counterclockwise until the buckle is completely exposed (due to the action of the sealing ring, this step requires a large external force), and lift the bellows cover in the vertical direction. Since the bellows cover does not directly contact the breathing gas, it only needs to be wiped with a clean slightly damp cloth, or soaked with a neutral detergent and rinsed with water. High-temperature steam cannot be used to sterilize the bellows cover. The high-temperature steam will deform the bellows cover and cannot be used normally. Do not use ethanol for cleaning.

5.2 Battery maintenance

5.2.1 Maintenance of battery performance

During battery use, it should be optimized regularly to maintain its service life. It is recommended to maintain the battery every 3 months of storage. Please follow the steps below

- 1) Take out the equipment and stabilize it for more than 2 hours at a room temperature of 5°C~30°C;
- 2) Connect the external power supply and charge the battery for 6~8 hours.
- 3) Reinstall the equipment.

5.2.2 Check battery performance

The performance of the battery may decrease as the usage time increases. Under normal circumstances, the battery life when fully charged is 4H. If the battery power supply time is significantly less than 4H, consider replacing the battery or contacting after-sales personnel.

Note: The service life of the battery depends on the frequency and time of use. If the battery is properly maintained and stored, the life of the lithium battery is about 3 years. If the battery is used improperly, its life may be shorter. We recommend replacing the lithium battery every 3 years.

5.3 Battery recycling

If the battery is obviously damaged or the battery capacity is exhausted, it should be replaced and recycled correctly. When disposing of used batteries, follow the corresponding regulations.



Do not disassemble the battery, put it into fire, or short-circuit it. Burning, explosion, or leakage of the battery may cause personal injury.

6. Warranty

The warranty only applies to new products purchased directly from TOOTOO Company or from TooToo authorized distributors, and the first purchaser extended from it.

For a period of 1 year from the date of delivery of the first buyer or buyer's order, the original manufacturer will guarantee the functional defects of the anesthesia machine

in terms of materials and workmanship, and comply with the operating instructions, maintenance manuals, corresponding labels and In the product description of the insert, during normal use under the same operating conditions, regular maintenance, replacement and repair are carried out in accordance with the instructions.

If the product is repaired or serviced by an organization other than TooToo, or is inconsistent with the instructions provided by TooToo, or is changed by an organization other than TooToo, or the product is abused or misused and caused by problems , TooToo will not accept any warranty application mentioned above. TooToo is not responsible for any accidental damage, indirect damage, special operation and other damage caused by improper use of the instrument.

7. Product Service

If you have any questions, please keep in touch with us

After-sales service unit:

TOOTOO MEDITECH CO., LTD.

Address: RM 607, HAIHANG CITY BUSINESS CENTER, LONGGANG, SHENZHEN, CHINA.

After-sales service telephone: +86-755-28306385

Phone: +86-755-28306385

Fax: +86-755-28306385

Email: info@newtootoo.com



深圳市谊业仪器有限公司

地址：中国深圳市龙岗区海航城商务中心607室

网址：www.newtootoo.com

TOOTOO MEDITECH CO., LTD.

Address: RM 607, HAIHANG CITY BUSINESS CENTER,
LONGGANG, SHENZHEN, CHINA.

Web: www.newtootoo.com