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# Boaray 600 Anesthesia Machine

## Datasheet


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# Technical Specification

| Physical Specifications | |
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| **Dimensions and weight** | |
| Dimensions (HxWxD) | 1450mm×1000mm×1330mm |
| Weight | 103 kg (Without vaporizer and cylinder) |
| **Top Shelf** | |
| Weight limit | 34 kg |
| Width x Depth | 578×360 mm |
| **Work Surface** | |
| Dimensions (HxWxD) | 827×557×311 mm |
| **Drawer (Internal Dimension)** | |
| Dimensions (HxWxD) | 150×298×348 mm |
| Quantity | Standard 2 |
| **Casters** | |
| Diameter | 125 mm |
| Brakes | All four casters with brakes |
| Material | Elastic thermoplastic rubber |
| **Ventilation Specifications** | |
| **Modes of Ventilation** | |
| Ventilation mode | VCV<br>PCV<br>PRVC<br>SIMV+VCV<br>SIMV+PCV<br>PSV<br>Manual<br>Standby |
| **Compensation** | |
| Leakage compensation, compliance compensation and altitude compensation | |
| **Ventilation Parameters** | |
| Patient type | Adult, Pediatric, Infant |
| Tidal volume | 10~1500ml (Volume controlled mode)<br>5~1500ml (Pressure controlled mode) |
| $P_{insp}$ | 1 ~ 70 $cmH_2O$ |
| $P_{limit}$ | 5 ~ 100 $cmH_2O$ |
| Freq | SIMV mode: 1 ~ 40 bpm<br>Others mode: 4 ~ 100 bpm |
| I:E | 4:1 ~ 1:10 |
| Tip:Ti | OFF, 5% ~ 50% |
| $T_i$ | 0.1 ~ 10 s |
| $F_{TRIG}$ | 1 ~ 15 L/min |
| $P_{supp}$ | OFF, 1 ~ 60 $cmH_2O$ |
| Sigh | ON, OFF |

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| **Positive End Expiratory Pressure (PEEP)** | | |
| Type | Integrated, electronic controlled | |
| PEEP | OFF, 4 ~ 30 $cmH_2O$ | |
| **Ventilator Performance** | | |
| Driving pressure | 280 kPa to 600 kPa | |
| Peak gas flow | 120 L/min + Fresh Gas Flow | |
| **Monitoring Parameters** | | |
| Minute volume | 0 ~ 60 L/min | |
| Tidal volume | 0 ~ 2500 ml | |
| $FiO_2$ | 21% ~ 100% | |
| Peak airway pressure | 0 ~ 100 $cmH_2O$ | |
| Mean pressure | 0 ~ 100 $cmH_2O$ | |
| Plateau pressure | 0 ~ 100 $cmH_2O$ | |
| I:E | 4:1 ~ 1:10 | |
| Rate | 0 ~100 bpm | |
| PEEP | 0 ~ 70 $cmH_2O$ | |
| Resistance (R) | 0 ~ 200 $cmH_2O$/(L/S) | |
| Compliance (C) | 0 ~ 200 ml/ $cmH_2O$ | |
| **Control Accuracy** | | |
| Volume delivery | ≤ 20mL: ±50%;<br>20 ~ 70mL(including 70): ±10mL;<br>＞70mL: ±20 mL or ±15% of the set value, whichever is greater | |
| Pressure delivery | ±2.0 $cmH_2O$ or ±7% of the set value, whichever is greater | |
| PEEP delivery | ±2.0 $cmH_2O$ or ±10% of the set value, whichever is greater | |
| Flow trigger | ±1.0 L/min or ±15% of the set value, whichever is greater | |
| **Monitoring Accuracy** | | |
| Volume monitoring | ≤70mL: ±10 mL;<br>>70mL: ±20 mL or ±15% of the actual value, whichever is greater | |
| Pressure monitoring | ±2.0 cmH2O or ±10% of the actual value, whichever is greater | |
| PEEP monitoring | ±2.0 cmH2O or ±10% of the actual value, whichever is greater | |
| MV monitoring | 0 ~ 50 L/min (including 50): ±0.2L/min, or ±15% of the actual value, whichever is greater;<br>50 ~ 60 L/min: ±20% of the actual value | |
| **Trend Graph** | | |
| 24 hours | | |
| **Log** | | |
| 500 events storage | | |
| **Alarm Settings** | | |
| Tidal volume | High | 10 ~ 1500 mL, OFF |
| | Low | OFF, 10 ~ 1500 mL |
| Minute volume | High | 1 ~ 40 L/min, OFF |
| | Low | OFF, 0 ~ 40 L/min |
| Airway pressure | High | 1 ~ 100 $cmH_2O$ |
| | Low | 0 ~ 99 $cmH_2O$ |
| Frequency | High | 1 ~ 100 bpm |
| | Low | 0 ~ 99 bpm |
| $FiO_2$ | High | 21% ~ 100%,OFF |

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| | Low | OFF, 18% ~ 99% |
| Apnea alarm | 10 ~ 40s | |
| Continuous airway pressure | 15s | |
| Negative pressure alarm | Paw < -10 $cmH_2O$ | |
| Alarm silence countdown timer | 120 to 0 seconds | |
| **System Language** | | |
| Chinese, English, Spanish, Portuguese | | |
| **Ventilator Component** | | |
| **Flow Sensor** | | |
| Type | Variable orifice flow sensor | |
| Position | Inspiratory and expiratory port | |
| **Oxygen Sensor** | | |
| Type | Chemical | |
| $FiO_2$ displayed | 21% to 100% | |
| Accuracy | ±2.5% (absolute error) | |
| Response time | ≤15 seconds | |
| **Ventilator Screen** | | |
| Display type | Color TFT touch screen, rotatable | |
| Display size | 15 inch | |
| Resolution | 1024 x 768 | |
| Display parameter | All setting and alarm parameters (including respiration rate, I:E, Tidal volume, Minute volume, PEEP, $P_{mean}$, $P_{peak}$, $P_{plat}$ and concentrations of $O_2$, EtCO2, $N_2O$ and Anesthesia gas) | |
| Display waveform | P-T, F-T, V-T, $CO_2$-T, SpO2-T | |
| Loop | P-V, F-V, F-P | |
| Timer | On screen timer | |
| **Communication Port** | | |
| Ethernet, RS-232, PS2, HDMI, USB | | |
| **Vaporizer** | | |
| Vaporizer brand | ibis200 Anesthetic Vaporizer or<br>Penlon Sigma Delta Anesthetic Vaporizer | |
| Support agent | Halothane, Enflurane, Isoflurane, Sevoflurane | |
| Position | Standard 2 | |
| Mounting mode | Selectatec®, with interlocking function | |
| Fill method | Key fill, Pour fill, Quick fill | |
| **Modules** | | |
| **MainStream $CO_2$ Module (Masimo IRMA)** | | |
| Displayed numeric | $EtCO_2$, $FiCO_2$ | |
| Measurement range | 0 ~ 15 % | |
| Accuracy | ±(0.2 vol%+ 2% of reading) | |
| Waveform / Loop | $CO_2$-T | |

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| $EtCO_2$ High alarm limit | Adult: 0.1 ~ 10.0%<br>Pediatric: 0.0 ~ 13.0% |
| $EtCO_2$ Low alarm limit | Adult: OFF, 0.0 ~ 9.9%<br>Pediatric: OFF, 0.0 ~12.0% |
| **Multi-gas Module (Masimo IRMA)** | |
| Measurement mode | Main-stream |
| Monitor gases | $CO_2$, $N_2O$, Halothane, Enflurane, Isoflurane, Sevoflurane, Desflurane, MAC. |
| Warm-up time | <20 sec (concentrations are reported and the automatic agent identification is running within 20 seconds). |
| Accuracy | **$CO_2$**<br>±(0.2 vol%+ 2% of reading)<br>**$N_2O$**<br>±(2 vol%+ 2% of reading)<br>**HAL, ENF, ISO, SEV, DES**<br>±(0.15 vol%+ 5% of reading) |
| **$SpO_2$ module** | |
| Displayed numeric | SpO2, PR |
| $SpO_2$ measurement range | 0 ~ 100% |
| PR measurement range | 30 ~ 250BPM |
| Waveform | SpO2-T |
| $SpO_2$ Low alarm limit | 70 ~ 99% |
| **Electrical Specifications** | |
| **Power and Battery Backup** | |
| Power input | 100 ~ 240 Vac, 50/60 Hz |
| Auxiliary electrical outlet | Up to 3 outlets (2A for each) |
| Battery backup | 60 min (powered by new fully-charged batteries with 25℃ ambient temperature) |
| Battery type | Build-in Li-ion battery, 11.1 VDC, 7800 mAh |
| Safety feature | In case of electricity and battery failure, manual ventilation, gas delivery and agent delivery are possible. |
| **Pneumatic Specifications** | |
| **ACGO (Auxiliary Common Gas Outlet)** | |
| Connector | ISO 22 mm OD and 15 mm ID |
| **Pipeline Supply** | |
| Gas type | $O_2$, $N_2O$ and Air |
| Pipeline input range | 280 to 600 kPa |
| Pipeline connection | NIST or DISS |
| **Pipeline Supply Pressure Gauge** | |
| Display type | Mechanical |
| Range | 0 to 1MPa |
| Accuracy | ±(4% of the full scale reading + 8% of the actual reading) |

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| **Cylinder Supply** | | |
| Cylinder type | E-size Cylinder (US standard or UK standard) | |
| $O_2$ input range | ≤15MPa | |
| $N_2O$ input range | ≤8MPa | |
| Cylinder connection | Pin-Index Safety System (PISS) | |
| Yoke configuration | $O_2$, $N_2O$ | |
| **Cylinder Supply Pressure Gauge** | | |
| Display type | Mechanical | |
| $O_2$ Range | 0 to 25 MPa | |
| $N_2O$ Range | 0 to 25 MPa | |
| Accuracy | ±(4% of the full scale reading + 8% of the actual reading) | |
| **$O_2$ Control** | | |
| Method | $N_2O$ shut off with loss of $O_2$ pressure | |
| $O_2$ Flush | 25 ~ 75 L/min | |
| **$O_2$-N2O Link System** | | |
| Type | Mechanical | |
| Range | $O_2$ concentration not lower than 21% | |
| **Auxiliary $O_2$ Flowmeter** | | |
| Range | 0 ~ 15 L/min | |
| Indicator | Flow tube | |
| **Mechanical Control Flowmeter** | | |
| $O_2$ flow range | Two flow tubes with the ranges of 0 ~ 1 L/Min and 1 ~ 10 L/min | |
| Air flow range | Two flow tubes with the ranges of 0 ~ 1 L/Min and 1 ~ 10 L/min | |
| $N_2O$ flow range | Two flow tubes with the ranges of 0 ~ 1 L/Min and 1 ~ 10 L/min | |
| Accuracy | ±10% of the indicated value (For flow between 10% and 100% of full scale)<br>±200mL/min(For the flow under 10% of the full scale) | |
| **Environmental Specifications** | | |
| Temperature | Operation | 10 ~ 40℃ |
| | Storage and transport | -20 ~ 55℃ |
| Relative humidity (non-condensing) | Operation | ≤ 80% R.H. |
| | Storage and transport | ≤ 93% R.H. |
| Atmospheric pressure | Operation | 70 ~ 106 kPa |
| | Storage and transport | 50 ~ 106 kPa |
| **Electromagnetic Compatibility** | | |
| Immunity | Complies with all requirements of IEC 60601-1-2 | |
| Emission | Complies with all requirements of IEC 60601-1-2 | |
| **Breathing System Specification** | | |
| Material | PPSU(Autoclavable) | |
| **$CO_2$ Absorber** | | |
| Absorbent capacity | 1500 mL(1.35kg) | |
| **Breathing Circuit Parameters** | | |
| Compliance | 0.87 mL/cmH2O (Manual mode)<br>Under the pressure of 3 kPa, filled with fresh CO2 absorbent recommended by the manufacturer | |
| Expiration resistance | < 0.6 kPa @30 L/min | |

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| Inspiration resistance | < 0.6 kPa @30 L/min |
| **System Pressure Gauge** | |
| Range | -20 ~ 100 $cmH_2O$ |
| Accuracy | ±(2% of the full scale reading + 5% of the actual reading) |
| **Ports and Connector** | |
| Exhalation,Inhalation, Manual bag port | 22 mm OD /15 mm ID conical |
| **APL Valve** | |
| Range | 2 ~ 70 $cmH_2O$ or 2 ~ 90 $cmH_2O$(optional) |
| Tactile knob indication at above 30 $cmH_2O$ | |
| Accuracy | ±10 cmH2O or ±15% of the setting value, whichever is greater |
| **Anesthetic Gas Scavenging System (AGSS)** | |
| Size (H x W x D) | 480 x 134 x 95 mm |
| Type of disposal system | Low Flow Active AGSS |
| Applicable standard | ISO 80601-2-13 |
| Pump rate | 40 ~ 50 L/min |
| Connector of the disposal system | ISO 9170-2 |