

# A7

## Anesthesia Workstation

### Physical Specifications

#### Dimensions and Weight

Height	1400 mm
Width	1050 mm (including breathing system)
Depth	805 mm
Weight	185 kg (with AG module, Auxiliary work surface and 3 yokes, without vaporizers and gas cylinders)

#### Top Shelf

Weight limit	40 kg
Width	616 mm
Depth	362 mm

#### Work Surface (Stainless steel)

Height	850 mm
Width	616 mm
Depth	380 mm

#### Auxiliary Work Surface

Weight limit	10 kg
Height	750 mm
Width	450 mm
Depth	330 mm

#### Side mounting Rails

Supporting weight	27 kg at a maximum distance of 0.41 m
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#### Drawer (3Xdrawers, Internal Dimension)

Height	135 mm
Width	440 mm
Depth	385 mm
Weight limit	5 kg

#### Bag Arm

Height	1150 mm
Length	312 mm
Swiveling angle	150 degrees

#### Casters

Diameter	15 cm
Brake	Centre brake system with Lock / Unlock icons

Cable pusher	cable pusher wish each caster
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#### Handle

Length	650 mm
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#### Work Light

Settings	OFF, Low, High
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#### Screen

Display type	Color LCD, 15 inch, 4:3 ratio diagonal TFT with touch screen
Display parameters	All setting and alarm parameters (including Breath rate, I/E ratio, Tidal volume, Minute volume, PEEP, MEAN, PEAK, PLAT, and O <sub>2</sub> concentration, EtCO <sub>2</sub> , N <sub>2</sub> O, Aesthesia gas concentration, BIS)
Graphic waveforms	Pressure, Flow, Volume, CO <sub>2</sub> , BIS, O <sub>2</sub> , Anesthetic gas, N <sub>2</sub> O
Spirometry loops	Pressure-Volume, Flow-Volume and Pressure-Flow
Timer	Display on screen timer
Screen Control	Touch pad/Touch screen/Mouse control

### Ventilator Specifications

#### Modes of Ventilation

Manual/Spontaneous Ventilation/Bypass  
Volume Control Ventilation (VCV) with PLV function



Pressure Control Ventilation (PCV) with/without volume guarantee (VG)  
Pressure Support Ventilation (PS) with apnea backup  
Synchronized Intermittent Mandatory Ventilation (SIMV-Volume Controlled and SIMV-Pressure Controlled)  
Synchronized Intermittent Mandatory Ventilation Volume Guarantee (SIMV-VG)  
Continuous Positive Airway Pressure/Pressure Support Ventilation (CPAP/PS)

#### Compensation

Circuit gas leakage compensation and automatic compliance compensation

#### Ventilation Parameters Range

Patient Size	Adult, Pediatric, Infant
Tidal volume	20~1500 mL ( (Volume Mode) (increments of 1 mL) 5~1500 mL (Pressure Mode)
Pinsp	5~70 cmH <sub>2</sub> O (increments of 1 cmH <sub>2</sub> O)
Plimit	10~100 cmH <sub>2</sub> O (increments of 1 cmH <sub>2</sub> O)
ΔPsupp	3~60 cmH <sub>2</sub> O (increments of 1 cmH <sub>2</sub> O) off, 3~60 cmH <sub>2</sub> O (CPAP/PS)
Respiration Rate	4~100 bpm (increments of 1 bpm)
I:E	4:1 - 1:8 (increments of 0.5)
Tpause	OFF, 5% - 60% (increments of 1%)
Tinsp	0.2 - 10.0 s (increments of 0.1 s)
Trigger window	5% - 90% (increments of 5%)
Flow trigger	0.2 ~ 15 L/min (increments of 0.1L/min)
Pressure trigger	-20~ -1 cmH <sub>2</sub> O (increments of 1 cmH <sub>2</sub> O)
Exp%	5% - 80% (increments of 1%)
Min Rate	2 - 60 bpm (increments of 1 bpm)
Tslope	0.0 - 2.0 s (increments of 0.1 s)
Apnea I: E	4:1~1:8 (increments of 0.5)
ΔPapnea	3 - 60 cmH <sub>2</sub> O (increments of 1 cmH <sub>2</sub> O)

#### Positive End Expiratory Pressure (PEEP)

Type	Integrated, electronic controlled
Range	OFF, 3~30 cmH <sub>2</sub> O (increments of 1 cm H <sub>2</sub> O)

#### Ventilator Performance

Driving pressure	280 kPa to 600 kPa
Flow valve range	1 to 120 L/min
Peak gas flow	120 L/min + Fresh Gas Flow

#### Monitoring Parameters

Minute volume	0 ~ 100 L/min
Tidal volume	0~3000 ml
Inspired oxygen (FiO <sub>2</sub> )	18% ~ 100%
Pressure (Peak,Mean,Plateau)	-20 ~ 120 cmH <sub>2</sub> O
Mean pressure	-20 ~ 120 cmH <sub>2</sub> O
Plateau pressure	-20 ~ 120 cmH <sub>2</sub> O
Rate	0 ~120 bpm
PEEP	0 ~ 70 cmH <sub>2</sub> O
Resistance (R)	0 ~ 600 cmH <sub>2</sub> O/(L/s)
Compliance (C)	0 ~ 300 ml/cmH <sub>2</sub> O

#### Control Accuracy

Volume delivery	O <sub>2</sub> driving: <60 ml: ± 10 ml ≥60 ml and ≤ 210 ml: ±15 ml >210 ml: ±7 % of the set value AIR driving:
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	<75 ml: ±15 ml
	≥75 ml: ± 20 ml or ± 10 % of the set value, whichever is greater
Pressure delivery	± 2.5 cmH <sub>2</sub> O or ± 7% of the set value, whichever is greater
PEEP	OFF: ± 3.0 cmH <sub>2</sub> O 3 to 30 cmH <sub>2</sub> O: ± 2.0 cmH <sub>2</sub> O, or ± 8% of the displayed value, whichever is greater

### Monitoring Accuracy

Volume monitoring	O <sub>2</sub> driving: < 60 mL: ± 10 mL ≥ 60 and ≤210 mL: ± 15 mL >210 mL: ± 7% of the set value Air driving: < 75 mL: ± 15 mL ≥ 75 mL ≤1500 mL: ± 20 mL or ± 10% of the measured value, whichever is greater >1500 mL: no defined
Pressure monitoring	± 2.0 cmH <sub>2</sub> O or ± 4% of the reading, whichever is greater
Rate	± 1bpm or ± 5% of the set value, whichever is greater
MV	± 0.1L/min or ± 8% of the reading, whichever is greater

### Alarm setting

Paw High	The greater of 10 and (Paw Low + 1) to 100 cmH <sub>2</sub> O
Paw Low	0 to the lesser of 70 and (Paw High -1) cmH <sub>2</sub> O
MV High	The greater of 0.2 and (MV Low + 0.1) to 25 L/min
MV Low	0 to the lesser of 20 and (MV High - 1) L/min
FiO <sub>2</sub> High	The greater of 21% and (FiO <sub>2</sub> Low + 1) to 100%, Off
FiO <sub>2</sub> Low	18 to the lesser of 98% and (FiO <sub>2</sub> High - 1)%
Apnea alarm	VTe < 10ml measured in 20s Paw < (PEEP + 3) cmH <sub>2</sub> O in 20s

### Lung Recruitment Tool

Lung Recruitment Maneuver :	Increasing PEEP progressively (with a maximum of 7 stages)
Adjustable Ventilation Parameters for Lung Recruitment:	Δpsupp, PEEP, Breaths, I:E, Rate

### Data Storage (Non-Volatile) and Recording

Configuration Storage:	One group of factory configuration, one group of user configuration
Patient types	Adult, Pediatric and Infant for each Configuration
Log Storage	500 entries of alarm log/500 entries of activity log/500 entries of error log/500 entries of service log
History trend	48 hours of continuous trend data (BIS, Fresh Gas, Ventilation, etc.)

### Pneumatic Specifications

#### Pipeline Supply

Gas type	O <sub>2</sub> , N <sub>2</sub> O and Air
Pipeline input range	280 to 600 kPa (40 to 87 psi)
Pipeline connections	DISS or NIST

#### Pipeline Supply Pressure Gauges

Display type	Electronical or Mechanical
Ranges	0 to 1000kPa (0 to 140 psi)
Accuracy	± (4% of the full scale reading + 8% of the actual reading)

#### Cylinder Supply

Cylinder Supply	E Cylinder (American style or UK style)
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O <sub>2</sub> Input Range	6.9 to 20 MPa (1000 to 2900 psi)
N <sub>2</sub> O Input Range	4.2 to 6 MPa (600 to 870 psi)
Air Input Range	6.9 to 20 MPa (1000 to 2900 psi)
Cylinder Connections	Pin-Index Safety System (PISS)
Yoke Configuration	O <sub>2</sub> , N <sub>2</sub> O, Air

#### Cylinder Supply Pressure Gauges

Display type	Electronical or Mechanical
Air Range	0 to 25 MPa (0 to 3500 psi)
O <sub>2</sub> Range	0 to 25 MPa (0 to 3500 psi)
N <sub>2</sub> O Range	0 to 10 MPa (0 to 1400 psi)
Accuracy	± (4% of the full scale reading+8% of the actual reading)

#### O<sub>2</sub> Controls

Supply failure alarm	185.5 to 254.5 kPa (27 to 36 psi)
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#### ACGO (Auxiliary Common Gas Outlet)

Control type	Electronical or Mechanical
Safety Pressure	A relief valve limits fresh gas pressure at ACGO outlet port to not more than 125 cmH <sub>2</sub> O
Fresh gas flow	0.2 to 18 L/min

#### Auxiliary O<sub>2</sub> Flowmeter

Flow Range	For each meter 0 ~ 15 L/min
Indicator	Flow tube

#### Auxiliary O<sub>2</sub> Gas Power Outlet

Pressure range	280 to 600 kPa
Maximum flow	≥ 90 L/min

#### O<sub>2</sub> Flush

Flow rate	35 to 50 L/min
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#### Built-in Suction Device

##### Venturi Suction Regulator

Supply	Air, from system gas source
Maximum vacuum	≥72 kPa at supply gas pressure of 280 kPa ≥73 kPa at supply gas pressure of 600 kPa
Maximum flow	≥25 L/min with pipeline gas at 280 kPa ≥32 L/min with pipeline drive gas at 600 kPa (without suction bottle and filter)

##### Continuous Suction Regulator

Supply	External vacuum
Maximum vacuum	517.5 mmHg to 540 mmHg (69 kPa to 72 kPa) with external vacuum applied of 540 mmHg and 40 L/min free flow
Maximum flow	39 L/min to 40 L/min with external vacuum applied of 540mmHg and 40 L/min free flow

#### Electronic Flow control system (Electronic Mixer)

##### Direct Flow Control Mode

O <sub>2</sub> flow range	0 to 15 L/min
Air flow range	0 to 15 L/min
N <sub>2</sub> O flow range	0 to 12 L/min
O <sub>2</sub> flow accuracy	± 50 ml/min or ± 5% of setting value, whichever is greater
Balance gas (Air/N <sub>2</sub> O) flow accuracy	± 50 ml/min or ±5% of setting value, whichever is greater

##### Total Flow Control Mode

Total flow range	0.2 to 18 L/min
Total flow accuracy	± 100 ml/min or ± 5% of setting value, whichever is greater

##### O<sub>2</sub> concentration

Range	21% to 100% (The balance gas is Air) 26% to 100% (The balance gas is N <sub>2</sub> O)
Accuracy	± 5% V/V for flows < 1 L/min ± 5% of setting for flows ≥ 1 L/min

##### Optimizer

Only available when AG or CO<sub>2</sub> Module is loaded

### Flow Pause

The fresh gas flow and ventilation will be paused for 1 minute at default. (Maximum 2 minutes)

### Backup Flow Control System

#### Control Type

Mechanical (Control Needle Valve and Knob)

#### Flow Range

Control Range (O<sub>2</sub>) 1 +/- 0.25 to 15 L/min

Control Range (Air) 0 to 15 L/min

#### Total flow meter

Range 0 to 10 L/min

Indicator Flow tube

Indicator accuracy ± 10% of the indicated value for flows (between 10% and 100% of full scale with oxygen)

### Breathing System Specification

#### Breathing system volume (Pre-pak)

Automatic ventilation 2850 ml

Manual ventilation 1800 ml

#### CO<sub>2</sub> Absorber Assembly

Absorber capacity 1 Pre-Pak or 1500 ml

Absorber Canister Contents  
1 Pre-Pak canister or  
Loose Fill absorbent

#### Water Collection Cup

Detachable with 6 mL of capacity

#### Inspiratory Airway Pressure Gauge

Range -20 ~ 100 cmH<sub>2</sub>O

Accuracy ± (2% of the full scale reading + 4% of the actual reading)

#### Flow Sensor

Type Variable orifice flow sensor

Location Inspiratory and expiratory port

#### Oxygen Sensor

Type Galvanic fuel cell

FiO<sub>2</sub> displayed 18% to 100%

Accuracy ± (volume fraction of 2.5 % +2.5 % gas level)

Response Time ≤20 seconds

#### Breathing system connectors

Exhalation 22 mm OD / 15 mm ID conical

Inhalation 22 mm OD /15 mm ID conical

Manual bag port 22 mm OD /15 mm ID conical

Connections to a Gas Scavenger 30 mm OD ISO

#### Bag-to-Ventilator Switch

Type Bi-stable

Control Switch between manual and mechanical ventilation

#### Adjustable Pressure Limiting (APL) Valve

Type Manually control with quick relief function

Range Approximately 0 (SP), 5 ~ 75 cmH<sub>2</sub>O

Tactile knob indication ≥ 30 cmH<sub>2</sub>O

Adjustable Range of Motion: 330 ± 10 degrees

#### Breathing System Temperature Controller

Breathing System Temperature Maintained to 35°C typical at 20°C ambient temperature

#### Anesthetic Gas Scavenging System (AGSS)

Size (H x W x D) 430 x 132 x 114 mm

Type of disposal system Active: High-flow or Low-flow  
Passive

Pump rate 75 ~ 105 L/min (High-flow)

25 ~ 50 L/min (Low-flow)

#### Materials

All materials in contact with exhaled patient gases are autoclavable up to a maximum temperature of 134°C, except flow sensors (being

not capable of being autoclaved), O<sub>2</sub> sensor, and mechanical pressure gauge.

All materials in contact with patient gas are latex free.

### Breathing circuit parameters

System Compliance ≤ 2 mL/cmH<sub>2</sub>O

Volume of gas lost due to internal compliance

Internal Compliance ≤ 4 mL/cmH<sub>2</sub>O

Impedance in Manual Mode ≤ 6 cmH<sub>2</sub>O

Impedance in Automatic Ventilation Mode ≤ 6 cmH<sub>2</sub>O

Leakage ≤ 150 mL @ 3 kPa

System Safety Pressure on Patient Circuit

110 ± 10 cmH<sub>2</sub>O @ 10 - 110 L/min

### Vaporizers

#### Anesthetic agent delivery

Vaporizer Mindray V60 Anesthetic Vaporizer or Penlon Sigma Alpha/Delta, or Drager Vapor 2000/D-Vapor

Support agents Halothane, Enflurane, Isoflurane, Sevoflurane, Desflurane

Position 3 positions (2 active, 1 inactive)

Mounting mode Selectatec®, with interlocking function  
Plug-in®, with interlocking function

#### Anesthetic Prediction

Patient Type Height: 150 to 200 cm

Weight: 40 to 140 kg

Age: 18 to 90 years old

Anesthetic Agents Desflurane, Enflurane, Isoflurane, Sevoflurane and Halothane

Prediction trend and waveform

The system displays 8 waveforms: dynamic short trend waveforms of FiAA, EtAA, FiO<sub>2</sub> and EtO<sub>2</sub> in the last 10 min

and prediction trend waveforms of FiAA, EtAA, FiO<sub>2</sub> and EtO<sub>2</sub> in the next 20 min.

Prediction deviation EtAA=0: less than volume fraction of 0.05 %  
EtAA≠0: - 20 % to 30 % of the measured EtAA, or - 5 % to 7.5 % of the vaporizer maximum setting, whichever is greater  
EtO<sub>2</sub> : - 10 % to 15 % of the measured EtO<sub>2</sub>, or volume fraction of - 5 % to 7.5 %, whichever is greater

#### Agent Consumption Calculation

Calculation range 0 to 3000 ml

Accuracy ± 2 mL, or ± 15% of the reading, whichever is larger

#### Agent consumption speed

Anesthetic agents Desflurane, Enflurane, Isoflurane, Sevoflurane and Halothane

Consumption speed

Desflurane: 0 ~ 900 ml/h

Sevoflurane: 0 ~ 450 ml/h

Enflurane, Isoflurane and Halothane: 0 ~ 250 ml/h

Accuracy ± 2ml/h or ±15% of the displayed value, whichever is greater

### Monitor Modules

#### Anesthesia Gas (AG) Module

Measurement mode Infrared absorption, Sidestream

Monitor gases CO<sub>2</sub>, O<sub>2</sub> (Paramagnetic O<sub>2</sub> module), N<sub>2</sub>O, and any of the five anesthetic agents: DES, ISO, ENF, SEV and HAL

Warm-up time 45 s (ISO accuracy mode)

10min (full accuracy mode)

Sample rate	Adu/Ped: 150, 180, 200 ml/min Neo: 100, 110, 120 ml/min
Range	CO <sub>2</sub> : 0% ~ 30% AA: 0% ~ 30% O <sub>2</sub> /N <sub>2</sub> O: 0% ~ 100%
<b>Side-Stream CO<sub>2</sub> Module</b>	
Measurement range	0 ~ 99 mmHg
Accuracy	± 2 mmHg (0 ~ 40 mmHg) ± 5% of the reading (41 ~ 76 mmHg) ± 10% of the reading (77 ~ 99 mmHg)
Sampling rate	Neonatal: 100 mL/min or 120 mL/min Adult/children: 120 mL/min or 150 mL/min
Warming-up time	< 1 min (enter the ISO accuracy mode), After 1 min (enter the full accuracy mode)

<b>Mainstream CO<sub>2</sub> Module</b>	
Measurement range	0 ~ 150 mmHg
Accuracy	± 2 mmHg (0 ~ 40 mmHg) ± 5% of the reading (41 ~ 70 mmHg) ± 8% of the reading (71 ~ 100 mmHg) ± 10% of the reading (101 ~ 150 mmHg)
Rise time	<60 ms
Response time	<2 s

<b>Micro-stream CO<sub>2</sub> Module</b>	
Measurement range	0 ~ 99 mmHg
Accuracy	0 ~ 38 mmHg: ± 2 mmHg 39 ~ 99 mmHg: ± (5 % of the reading + 0.08 % of the reading minus 38 mmHg)
Sampling rate	50 ml/min
Initialization time	30s
Response time	2.9s

<b>BIS/BISx4 Module</b>	
BIS/BIS L, BIS R	0 ~ 100
Sweep speed	6.25 mm/s, 12.5 mm/s, 25 mm/s or 50 mm/s
Input impedance	> 50 Mohm
Noise (RTI)	< 0.3 uV (0.25 ~ 50 Hz)
Input signal range	± 1 mv
EEG bandwidth	0.25 ~ 100 Hz
Patient leakage current	< 10 uA
Alarm limit	BIS high: 2 ~ 100 BIS low: 0 ~ 98
Calculated parameters	SQI/SQI L, SQI R; EMG/EMG L, EMG R; SR/SR L, SR R; SEF/SEF L, SEF R; TP/TP L, TP R; BC/BC L, BC R; sBIS L, sBIS R; sEMG L, sEMG R; ASYM
Impedance range	0 ~ 999 Kohm

<b>NMT Module</b>	
Conformity with Standard	IEC 60601-2-10
Stimulation output	
Pulse width:	100, 200, or 300 µs; monophasic rectangle pulse; Accuracy: ± 10 %
Stimulation current range:	0 to 60 mA in increments of 5 mA Accuracy: ± 5 % or ± 2mA, whichever is greater
Maximum skin resistance:	3 kΩ @ 60 mA, 5 kΩ @ 40 mA
Block Recovery	OFF, 1,2, 3, 4, 5 %, 10 %, 20 %, 30 %, 40 %, 50 %, 60 %, 70 %, 80 %, 90 %, 100 %
TOF (Train Of Four) mode	
TOF-Ratio (response percentage) :	5 % to 160 %
TOF-Count (number of responses) :	0 to 4

TOF-T1% (response to the first stimulus as percentage of the reference value) :	0 % to 200 %
ST (Single Twitch) mode	
ST-Ratio (response percentage) :	0 % to 200 %
DBS (Double-Burst Stimulation) 3.2/3.3 mode	
DBS-Ratio (response percentage) :	5 % to 160 %
DBS-Count (number of responses):	0 to 2
PTC (Post-Tetanic Count) mode	
PTC-Count (number of responses) :	0 to 20

## Electrical Specifications

### Main Electrical Power

Power input	220-240 Vac, 50/60 Hz, 6A max 100-240 Vac, 50/60 Hz, 7A max
Power Cord	5 m (length)

### Battery Power

Battery type	Sealed Lithium-ion, 11.1 VDC, 4.5 Ah (2 batteries)
Run-time	New battery: minimum 90 minutes under typical operating conditions
Time to Shutdown from Lower Battery Alarm	5 minutes minimum (new fully-charged battery)
Battery Charge Time	8 hours max from an initial charge of 10%. Charging occurs whenever AC is applied to the A7 System (New Battery)

### Auxiliary Electrical Outlets

Number of Outlets	4
Output Current	3 A for each outlet, 5 A for total

## Environmental Specifications

### Operating

Temperature	10 ~ 40°C
Relative humidity	15% ~ 95% (noncondensing)
Barometric (Kpa)	70 ~ 106.7 kPa

### Storage

Temperature	-20 ~ 60°C for main unit, -20 ~ 50°C for O <sub>2</sub> sensor
Relative humidity	10% ~ 95% (noncondensing)
Barometric	50 ~ 106.7 kPa

### Resistance to Ingress of Fluids

Complies with the requirements of clause 11.6.3 in IEC 60601-1 and also the requirements in IEC 60529 for protection against vertically falling water drops equipment (IPX1)

## Interface

Communication Port (Sp1)	RS-232C compatible serial interface (DB9)
Network Port (Cs1)	RJ-45 network port
USB Ports (SB1,SB2)	Two USB ports
Data Port (DP1)	One test port for connection of calibration equipment by a Mindray-authorized service representative
VGA Port	One VGA port for inputting the VGA video signal of the main to external display

Please contact your local Mindray sales representative for the most current information.

<p>Mindray Building, Keji 12th Road South, High-tech Industrial Park, Nanshan, Shenzhen 518057, P.R. China Tel: +86 755 8188 8998 Fax: +86 755 26582680 E-mail: intl-market@mindray.com www.mindray.com</p>	<p><b>mindray</b>   Healthcare with reach are registered trademarks or trademarks owned by Shenzhen Mindray Bio-medical Electronics Co., LTD © 2017 Shenzhen Mindray Bio-medical Electronics Co., Ltd. All rights reserved. Specifications subject to changes without prior notice. P/N: ENG-A7 datasheet-210285X4P-20180122</p>
	