A8

Anesthesia system

Physical Specifications

Dimensions and Weight

Height	1490 mm
Width	910 mm
Depth	705 mm
Weight	160 kg (with AG module and 3 yokes, without vaporizers and gas cylinders)

Work Surface

Height	850 mm
Width	590 mm
Depth	325 mm
Weight limit	30 kg

Drawer (3 drawers, Internal Dimension)

Height	140 mm
Width	420 mm
Depth	315 mm
Weight limit	5 kg

Bag Arm

Height	1130 mm
Length	312 mm
Swiveling angle	120 degrees

Casters

Diameter	12.5 cm
Brake	Centre brake with Lock / Unlock icons
Cable pusher	Cable pusher for each caster

Side mounting GCX Rails

Upper left length	130 mm
Upper right length	130 mm
Lower right length	485 mm
Supporting weight	27 kg at a maximum distance of 0.41 m

Work Light

Settings	OFF, Low, High

Main Screen

Display size	18.5 inch
Display type	Color LCD with capacitive touch screen
Resolution	1920 x 1080
Rotated	360 degrees
Tilted	60 degrees
Display parameters	All setting and alarm parameters (including Breath rate, I/E ratio, Tidal volume, Minute volume, PEEP, MEAN, PEAK, PLAT, and O_2 concentration, $EtCO_2$, N_2O, Aesthesia gas concentration, BIS)
Graphic waveforms	Pressure, Flow, Volume, CO_2, O_2, Anesthetic gas, N2O, BIS, Pes, Ptp Up to 5 waveforms display simultaneously
Spirometry loops	Pressure-Volume, Flow-Volume and Pressure-Flow
Timer	Display on screen timer

System status display

Display size	8.4 inch
Display type	Color LCD
Resolution	800 x 600
Display content	Volume exchanger indicator, gas supply pressure, AGSS status

Ventilator Specifications

Modes of Ventilation

Manual/Spontaneous ventilation/Bypass
Volume Control Ventilation (VCV) with PLV function
Pressure Control Ventilation (PCV)
Pressure Control Ventilation with volume guarantee (PCV-VG)
Continuous Positive Airway Pressure/Pressure Support Ventilation with apnea backup (CPAP/PS)
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)
Airway Pressure Release Ventilation (APRV)
Adaptive Minute Ventilation (AMV)

Compensation

Circuit gas leakage compensation and automatic compliance compensation

Ventilation Parameters Range

Patient type	Adult, Pediatric, Neonate
Tidal volume	10 to 1500 mL (VCV, SIMV-VC) 5 to 1500 mL (PCV-VG, SIMV-VG) With TV/IBW indicator
Pinsp	5 to 90 cmH2O
Plimit	5 to 100 cmH_2O
ΔPsupp	0, 3 to 60 cmH_2O (CPAP/PS)
Respiration rate	4 to 100 bpm
I:E	4:1 to 1:8
Tpause	OFF, 5% to 60%
Tinsp	0.2 to 10.0 s
Trigger window	5% to 90%
Flow trigger	0.2 to 15 L/min
Pressure trigger	-20 to -1 cmH_2O
Exp%	5% to 80%
Min rate	2 to 60 bpm
Tslope	0.0 to 2.0 s
Apnea I: E	4:1 to 1:8
ΔPapnea	3 to 60 cmH_2O
Phigh	3 to 90 cmH_2O
Plow	3 to 50 cmH_2O
Thigh	0.2 to 10.0 s
Tlow	0.2 to 10.0 s
MV%	25% to 350%

Positive End Expiratory Pressure (PEEP)

Type	Integrated, electronic controlled
Range	0 to 50 cmH_2O

Monitoring Parameters

Tidal volume	0 to 3000 ml
Minute volume	0 to 100 L/min
Minute volume leakage	0 to 10.0 L/min
Peak pressure	-20 to 120 cmH_2O
Mean pressure	-20 to 120 cmH_2O
Plateau pressure	-20 to 120 cmH_2O
I:E	4:1 to 1:10

Rate	0 to 150 bpm
PEEP	0 to 70 cmH_2O
Resistance (R)	0 to 600 $cmH_2O/(L/s)$
Compliance (C)	0 to 300 ml/cmH_2O
Inspired oxygen (FiO_2)	18% to 100%

Control Accuracy

Volume delivery	≤60 ml: ± 10 ml >60 ml and ≤ 210 ml: ±15 ml >210 ml: ±7 % of the set value
Pressure delivery	± 2.0 cmH_2O or ± 7% of the set value, whichever is greater
PEEP	± 2.0 cmH_2O or ± 7% of the set value, whichever is greater
MV%	± 10% or ± 10% of the set value, whichever is greater

Monitoring Accuracy

Volume monitoring	≤60 mL: ± 10 mL >60 and ≤210 mL: ± 15 mL >210 mL: ± 7% of the reading
Pressure monitoring	± 2.0 cmH_2O or ± 4% of the reading, whichever is greater
Rate	± 1bpm or ± 5% of the reading, whichever is smaller
MV	± 0.1L/min or ± 8% of the reading, whichever is greater

Alarm Setting

Paw High	2 to 100 cmH_2O
Paw Low	0 to (Paw High – 2) cmH_2O
TV High	5 to 1600 mL
TV Low	OFF, 0 to (TV High – 5) mL
MV High	0.2 to 100 L/min
MV Low	0 to 15 L/min: 0 to (MV High-0.2) L/min 15 to 100 L/min: 15 to (MV High – 1) L/min
FiO_2 High	20% to 100%, OFF
FiO_2 Low	18% to (FiO_2 High – 2) %
Apnea alarm	No breath has been detected within the apnea time.
Apnea delay time	5 to 60 s (by volume or pressure) 10 to 40 s (by CO2 waveform)

Lung Recruitment Tool

Multi-step recruitment (Increasing PEEP progressively)

Control parameters	a maximum of 7 steps Δpsupp, PEEP, Breaths, I:E, Rate PEEP on exit
Preset procedure	up to 5

One-step recruitment (sustain inflation)

Control parameters	Pressure Hold, Hold Time, PEEP on exit
Cycle Interval	OFF, 1 - 180 min

Auxiliary Pressure Monitoring

Monitor waveform	Ptp, Pes
Monitor parameter	PtpI, PtpE, ΔPtp, PesI, PesE, ΔPes

Data Storage and Recording

Configuration storage	up to 10 customized profiles
Log storage	10000 entries of alarm and activity logs
History trend	48 hours of continuous trend data
Screenshot	up to 50

Pre-use system check

Fully automatic performed by system, including hardware, flowmeter, gas supply, power supply, module, breathing circuit leakage and compliance, AGSS

Pneumatic Specifications

Pipeline Supply

Gas type	O_2, N_2O and Air
Pipeline input range	280 to 600 kPa (40 to 87 psi)
Pipeline connections	DISS or NIST

Pipeline Supply Pressure Monitoring

Display type	Electronic
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)
O2 input range	6.9 to 20 MPa (1000 to 2900 psi)
N2O 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 configurationO2, N2O, Air

Cylinder Supply Pressure Gauges

Display type	Mechanical or Electronic
Air range	0 to 25 MPa (0 to 3500 psi)
O2 range	0 to 25 MPa (0 to 3500 psi)
N2O range	0 to 10 MPa (0 to 1400 psi)
Accuracy	± (4% of the full scale reading+8% of the actual reading)

Ventilator Performance

Peak gas flow	180 L/min + Fresh Gas Flow

ACGO (Auxiliary Common Gas Outlet)

Control type	Mechanical
Safety pressure	A relief valve limits fresh gas pressure at ACGO outlet port to not more than 12.5 kPa

O_2 Flush

Flow rate	35 to 50 L/min

Auxiliary O2 & Air Flowmeter

Flow range	0 to 15 L/min
Oxygen concentration	21 % to 100 %
Indicator	Glass tube and LED display

High Flow Nasal Cannula

Flow range	2 to 100 L/min
Oxygen concentration	21 % to100 %
Indicator	Glass tube and LED display

Auxiliary High Pressure O_2 Outlet

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

O_2 Controls

Supply failure alarm	≤ 220 kPa

Anesthetic Gas Scavenging System (AGSS)

Type of disposal system	Passive Active: High-flow or low-flow
Pump rate	75 to 105 L/min (High-flow) 25 to 50 L/min (Low-flow)
Management	Scavenging flow rate monitoring and alarm Automatically switch off when standby

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

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_2 flow range	0, 0.2 to 15 L/min
Air flow range	0 to 15 L/min
N_2O flow range	0 to 12 L/min

O_2 flow accuracy	± 50 ml/min or ± 5% of setting value, whichever is greater
Balance gas (Air/N_2O) flow accuracy	± 50 ml/min or ±5% of setting value, whichever is greater

Total Flow Control Mode

Total flow range	0, 0.2 to 20 L/min
Total flow accuracy	± 100 ml/min or ± 5% of setting value, whichever is greater

O_2 concentration

Range	21% to 100% (The balance gas is Air) 26% to 100% (The balance gas is N_2O)
Accuracy	± 5% V/V for flows < 1 L/min ± 5% of setting for flows ≥ 1 L/min

Optimizer

Available when AG 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_2)	1 to 15 L/min
Control range (Air)	0 to 15 L/min

Total flow meter

Range	0 to 15 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

Automatic ventilation	1800 ml
Manual ventilation	1950 ml

CO_2 Absorber Assembly

Absorber capacity	1500 ml
Absorber type	1 Pre-Pak canister or Loose Fill absorbent

Inspiratory Airway Pressure Gauge

Range	-20 to 100 cmH_2O
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_2 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

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 and illumination
Range	Approximately (SP), 5 to 70 cmH_2O
Tactile knob indication	≥ 30 cmH_2O

Breathing Circuit Parameters

System compliance	≤ 2 mL/cmH_2O Volume of gas lost due to internal compliance
Impedance in manual mode	≤ 6 cmH_2O
Impedance in automatic ventilation mode	≤ 6 cmH_2O
Leakage	≤ 50 mL @ 3 kPa
System safety pressure on patient circuit	110 ± 10 cmH_2O

Breathing System Temperature Controller

Breathing system temperature maintained at least 31°C typical at 20°C ambient temperature in normal condition

Materials

All materials in contact with exhaled patient gases are autoclavable up to a maximum temperature of 134°C, except O_2 sensor and mechanical pressure gauge.

All materials in contact with patient gas are latex free.

Vaporizers

Anesthetic agent delivery

Vaporizer	Mindray V60 Anesthetic Vaporizer
Support agents	Halothane, Isoflurane, Sevoflurane, Desflurane
Position	Max.3 positisons (2 active, 1 inactive)
Mounting mode	Selectatec®, with interlocking function

Monitor Modules

Anesthesia Gas (AG) Module

Conformity with standard ISO 80601-2-55

Measurement mode	Infrared absorption, sidestream
Monitor gases	CO_2 , O_2 (Paramagnetic O_2 module), N_2O, 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
Monitoring range	CO_2: 0% to 30% (0.0 to 30 kPa, 0.0 to 226 mmHg) O_2/N_2O: 0% to 100% HAL, ISO, ENF: 0% to 30.0% SEV: 0% to 30.0% DES: 0% to 30.0%

BIS/BISx4 Module

Conformity with standard IEC 60601-2-26

BIS, BIS L/ BIS R	0 to 100
Sweep speed	6.25 mm/s,12.5 mm/s, 25 mm/s or 50 mm/s
Alarm limit	BIS high: 2 to 100 BIS low: 0 to (BIS high -2)
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

NMT Module

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

Anesthesia Function

Anesthetic Prediction

Patient type	Height: 150 to 200 cm Weight: 40 to 140 kg Age: 18 to 90 years old
Anesthetic agents	Desflurane, Isoflurane, Sevoflurane and Halothane
Prediction trend and waveform	Dynamic short trend waveforms of FiAA, EtAA, FiO_2 and EtO_2 in the last 10 min and prediction trend waveforms of FiAA, EtAA, FiO_2 and EtO_2 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_2 : - 10 % to 15 % of the measured EtO_2, or volume fraction of - 5 % to 7.5 %, whichever is greater

Agent Consumption Calculation

Usage speed range	HAL, ISO: 0 mL/h ~ 250 mL/h SEV: 0 mL/h ~ 450 mL/h DES: 0 mL/h ~ 900 mL/h
Accuracy	± 2 mL/h, or ± 15% of the reading, whichever is larger
Total usage range	0 to 3000 ml
Accuracy	± 2 mL, or ± 15% of the reading, whichever is larger

Electrical Specifications

Main Electrical Power

Power input	220-240 Vac, 50/60 Hz, 10A max 100-240 Vac, 50/60 Hz, 10A max 100-120 Vac, 50/60 Hz, 10A max
Power cord	5 m (length)

Battery Power

Battery type	Lead-acid, 12 VDC, 32 Ah (2 batteries) 12 VDC, 16 Ah (1 battery)
Run-time	One new battery: minimum 90 minutes under typical operating conditions Two new batteries: minimum 180 minutes under typical operating conditions
Time to shut down from the first Lower Battery Alarm	5 minutes minimum (new fully-charged battery)
Battery charge time	<12 hours

Auxiliary Electrical Outlets

Number of outlets	4
Output current	3 A for each outlet, 5 A for total

Communication Port

Communication port	RS-232 compatible serial interface (DB9)
Network port	Two RJ-45 network ports
USB port	Four USB ports
Video signal port	One VGA port for inputting the VGA video signal of the main to external display

Environmental Specifications

Operating

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

Storage

Temperature	-20 to 60°C for main unit, -20 to 50°C for O_2 sensor
Relative humidity	10% to 95% (noncondensing)
Barometric	50 to 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)

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

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