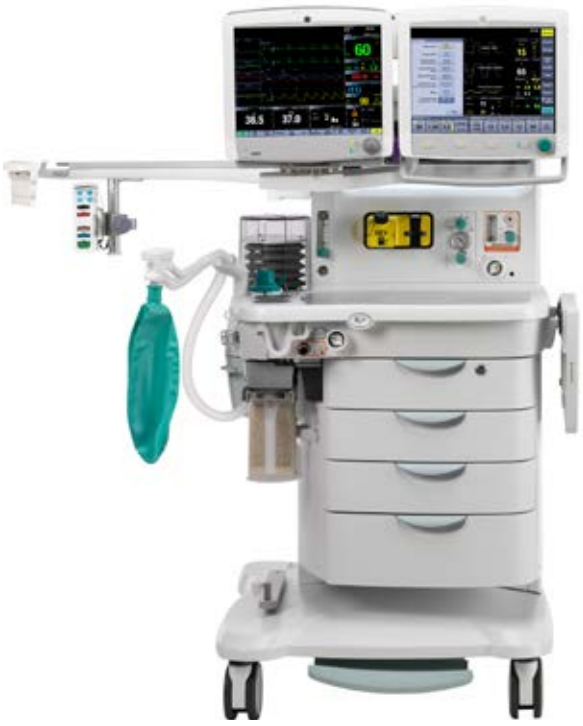
GE

Aisys CS²

Advanced and Sustainable Anaesthesia Care



Shown with PSM and B650 CARESCAPE Monitor

A true Carestation experience

- Designed for seamless integration with GE CARESCAPE monitors.
- Enhanced with the ultra-compact CARESCAPE Respiratory Modules for comprehensive airway gas analysis of your patients, from neonates to adults.
- Displays breath by breath Patient Spirometry for airway pressure, flow, volume, compliance, PEEP and airway resistance measured at the patient's airway.

Exceptional user interface

- 15" full colour display utilising surface acoustic wave touch screen technology.
- Simplified workflow with configurable 'Quick Picks' for fast agent, oxygen and fresh gas flow adjustments.
- Auto alarm limits with tunnelling alarms to help you optimise alarm management for each patient.

Digitally enabled target control

- Et Control** automatically adjusts fresh gas concentrations to quickly and efficiently achieve and maintain end tidal oxygen and end tidal agent targets.
- Estimated MAC display helps you establish end tidal agent targets.

Decision support for non-automated low flow

- ecoFLOW displays agent consumption to help you mitigate wasteful over-delivery of fresh gas flow and help you avoid delivery of hypoxic mixtures in the circle breathing system during non-automated low-flow anaesthesia.

Advanced ventilation for neonates to adults

- ICU-inspired ventilator, with digitally controlled flow valve technology to help achieve set pressures and volumes quickly, maximizing time available for gas exchange across a wide range of patients.
- Wide range of ventilation modes offered, including VCV, PCV, PSVPro, PCV-VG, SIMV VCV, SIMV PCV, CPAP+PSV and the new SIMV PCV-VG, designed to offer support to spontaneously breathing patients.

Automated Vital Capacity and Cycling lung ventilation procedures

- Designed to help you manage lung ventilation issues during general anaesthesia.
- Vital Capacity automates the manual bag 'squeeze and hold' manoeuvre.
- Cycling provides a configurable toolkit of settings with automated delivery.

Advanced Breathing System (ABS)

- Specifically designed for low flow to help provide fast gas kinetics for rapid wash-in and wash-out of anaesthetic agent.

**** Aisys CS² and Et Control are not available for sale in the United States. Not cleared or approved by the FDA. Not available in all markets.**

Physical Specifications

Dimensions

Height:	133.9 cm/52.7 in
Height (with vertical arm):	190.5 cm/75.0 in 211 cm/83.1 in
Width:	68 cm/26.8 in
Depth:	82 cm/32.3 in
Weight:	190 kg/419 lbs

Top shelf

Weight limit:	45 kg/100 lb
Width:	55 cm/21.65 in
Depth:	51.6 cm/20.31 in

Upper shelf (optional)

Weight limit:	23 kg/50 lb
Width:	54.8 cm/21.57 in
Depth:	44.4 cm/17.48 in

Work surface

Height:	87.5 cm/34.4 in
Size:	2684.2 cm^2/416 in^2

Folding side shelf (optional)

Weight limit:	12 kg/25 lb
Height:	88.17 cm/34.7 in
Width:	27.7 cm/10.91 in
Depth:	36.6 cm/14.41 in

DIN rail (optional)

Side of machine:	53.9 cm/21.22 in

Drawers (internal dimensions)

Small

Height:	10.5 cm/4.13 in
Width:	37.80 cm/14.88 in
Depth:	37.64 cm/14.82 in

Large

Height:	15.0 cm/5.91 in
Width:	37.80 cm/14.88 in
Depth:	37.64 cm/14.82 in

Absorber bag arm (optional)

Arm length:	39.8 cm/15.67 in
Bag arm height (adjustable):	98 cm/38.6 in 123 cm/48.4 in

Casters

Diameter:	12.5 cm/5 in
Brakes:	Central brake

Pendant mounting interface (optional)*

Height from floor:	76 cm/29.92 in
Suspended mass limit:	364 kg/800 lb

Ventilator Operating Specifications

Modes of ventilation (standard)

Volume Control Mode with tidal volume compensation

Modes of ventilation (optional)

Pressure Control and PCV-VG (Pressure control volume guarantee)

Synchronised Intermittent Mandatory Ventilation (SIMV) (volume, pressure and PCV-VG)

PSVPro (Pressure Support with Apnea backup)

CPAP+PSV (Pressure support mode)

Notification of spontaneous breathing

Patient-generated breaths will change pressure and flow waveform color for immediate clinician notification

Ventilation parameters

Tidal volume range:	20 to 1500 mL (Volume Control, PCV-VG, SIMV and SIMV PCV-VG modes)
Incremental settings:	20 to 50 mL (increments of 1 mL) 50 to 100 mL (increments of 5 mL) 100 to 300 mL (increments of 10 mL) 300 to 1000 mL (increments of 25 mL) 1000 to 1500 mL (increments of 50 mL)
Minute volume range:	Less than 0.1 to 99.9 L/min
Pressure (P) *Inspired* range:	5 to 60 cmH_2O (increments of 1 cmH_2O) 5 to 1500 mL volume delivery
Pressure (P) *max* range:	12 to 100 cmH_2O (increments of 1 cmH_2O)
Pressure (P) *support* range:	Off, 2 to 40 cmH_2O (increments of 1 cmH_2O)
Rate: for	Rate: 4 to 100 breaths per minute Volume Control, Pressure Control
and	PCV-VG; 2 to 60 breaths per minute for SIMV, PSVPro, SIMV PCV-VG; 4 to 60 breaths per minute for
CPAP+PSV	(increments of 1 breath per minute)

* Interface compatible with Kreuzer, Dräger and ceiling columns. Contact your local GE Healthcare representative for solutions to other ceiling column manufacturers.

Ventilator Operating Specifications *(continued)*

Inspiratory/expiratory ratio:	2:1 to 1:8 (increments of 0.5)
Inspiratory time:	Inspiratory time: 0.2 to 5.0 seconds (increments of 0.1 seconds) (SIMV, PSVPro, SIMV PCV-VG and CPAP+PSV)
Trigger window:	0 to 80% (increments of 5%)
Flow trigger:	1 to 10 L/min (increments of 0.5 L/min) 0.2 to 1 L/min (increments of 0.2 L/min)
Inspiration termination level:	5 to 75% (increments of 5%) - Rise Rate 1-10 (PCV, PCV-VG, SIMV, PSVPro, CPAP+PSV and SIMV PCV-VG)
Inspiratory Pause range:	0-60%

Positive End Expiratory Pressure (PEEP)

Type:	Integrated, electronically controlled
Range:	OFF, 4 to 30 cmH_2O (increments of 1 cmH_2O)

Ventilator performance

Pressure range at inlet:	240 kPa to 700 kPa/35 psig to 102 psig
Peak gas flow:	120 L/min + fresh gas flow
Flow valve range:	1 to 120 L/min
Flow compensation range:	200 mL/min to 15 L/min

Patient Spirometry

Pressure-volume loop

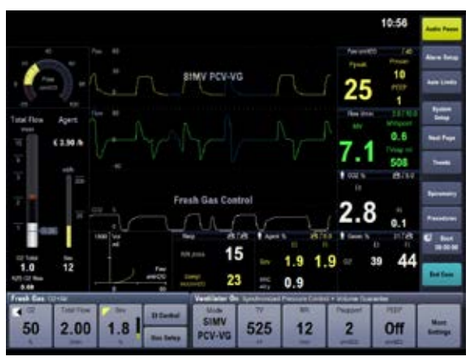
Flow-volume loop

Pressure-flow loop

Airway pressure and flow waveforms

Adjustable low and high alarm limits for Ppeak and MVexp

Detection through machine flow transducers.



Anaesthesia delivery screen

Ventilator Accuracy

Delivery/monitoring accuracy

Volume delivery:	> 210 mL = better than 7% ≤ 210 mL = better than 15 mL < 60 mL = better than 10 mL
Pressure delivery:	±10% or ±3 cmH_2O
PEEP delivery:	±1.5 cmH_2O
Volume monitoring:	> 210 mL = better than 9% ≤ 210 mL = better than 18 mL < 60 mL = better than 10 mL
Pressure monitoring:	±5% or ±2 cmH_2O

Alarm settings

Tidal volume (V_{TE}):	Low: OFF, 1 to 1500 mL High: 20 to 1600 mL, OFF
Minute volume (V_E):	Low: OFF, 0.1 to 10 L/min High: 0.5 to 30 L/min, OFF
Inspired oxygen (FiO_2):	Low: 18 to 99% High: 19 to 100%, OFF
Apnea alarm:	***Mechanical ventilation ON***: < 5 mL breath measured in 10 to 30 seconds, increments of 1 second ***Mechanical ventilation OFF:*** < 5 mL breath measured in 10 to 30 seconds, increments of 1 second
Low airway pressure:	4 cmH_2O above PEEP
High pressure:	12 to 100 cmH_2O (increments of 1 cmH_2O)
Sustained airway pressure:	***Mechanical ventilation ON:*** (P) *max* < 30 cmH_2O, the sustained limit is 6 cmH_2O (P) *max* 30 to 60 cmH_2O, the sustained limit is 20% of (P) *max* (P) *max* > 60 cmH_2O, the sustained limit is 12 cmH_2O ***PEEP and mechanical ventilation ON:*** Sustained limit increases by PEEP minus 2 cmH_2O ***Mechanical ventilation OFF:*** (P) *max* ≤ 60 cmH_2O, the sustained limit is 50% of (P) *max* (P) *max* > 60 cmH_2O, the sustained limit is 30 cmH_2O
Subatmospheric pressure:	Paw < -10 cmH_2O
Alarm silence countdown timer:	120 to 0 seconds

Ventilator Components

Flow transducer

Type:	Variable orifice flow sensor
Dimensions:	22 mm OD and 15 mm ID
Location:	Inspiratory outlet and expiratory inlet

(Optional autoclavable sensor available)

Oxygen sensor

Type:	Optional galvanic fuel cell or paramagnetic with Respiratory Module option

Ventilator screen

Display size:	38 cm/15 in
Pixel format:	1024 (H) x 768 (V)

Communication ports

RS-232C compatible serial interface

Ethernet

Datex-Ohmeda device interface solutions port

USB port

VGA Output

Aladin$_2$ Cassette

Anaesthetic agent delivery

Vaporizer:	Aladin$_2$ Cassette - Available with Isoflurane, Desflurane, Sevoflurane and Enflurane
Number of active positions:	1

Dimensions

Height:	7 cm/2.76 in
Depth:	24 cm/9.45 in
Width:	14 cm/5.51 in
Empty weight:	2.8 kg/6.2 lb

Cassette handling

No restriction for tilting during storage or handling

Agent capacity

Total (Enf, Iso, Sev):	220 mL
Total (Des):	240 mL
When cassette indicator shows empty (Enf, Iso, Sev):	125 mL (95 mL residual volume)
When cassette indicator shows empty (Des):	140 mL (100 mL residual volume)

Accuracy

All agents in typical operating conditions. Fresh gas flow range 1.0 to 10 L/min. Ambient temperature 18° to 25°C/ 64.4° to 77°F.

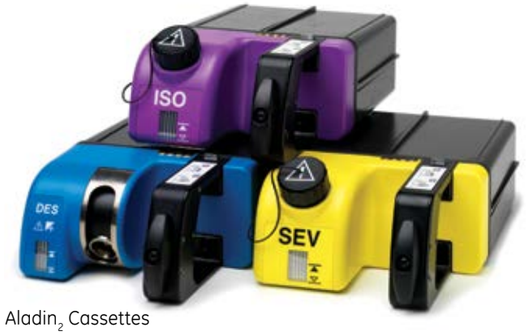
Enflurane, Isoflurane, Sevoflurane:	±0.2% v/v of full scale or ±10% of setting (whichever is greater)
Desflurane:	±0.5% v/v of full scale or ±10% of setting (whichever is greater)

In other operating conditions. Fresh gas flow range 0.2 to 10 L/min. Ambient temperature 10° to 35°C/50° to 95°F.

Enflurane, Isoflurane, Sevoflurane:	±0.4% v/v of full scale or ±20% of setting (whichever is greater)
Desflurane:	±1.0% v/v of full scale or ±20% of setting (whichever is greater)

Agent setting ranges

Enflurane and Isoflurane:	OFF, 0.2 to 5% in fresh gas flow, resolution 0.1%
Sevoflurane:	OFF, 0.2 to 8% in fresh gas flow, resolution 0.1%
Desflurane:	OFF, 1.0 to 18% in fresh gas flow, resolution 0.2%



Aladin$_2$ Cassettes

CARESCAPE Respiratory Modules

General specifications

E-sCAiO, E-sCAiOV, E-sCAiOE, E-sCAiOVE

Size (W x D x H):	3.8 x 20.5 x 11.3 cm/1.5 x 8.1 x 4.4 in
Weight:	0.7 kg/1.5 lb
Sampling rate:	120 ±20 mL/min

Automatic compensation for atmospheric pressure variation (500 to 800 mmHg), temperature, and CO_2, O_2, N_2O and anaesthetic agent cross effects.

CARESCAPE Respiratory Modules *(continued)*

Non-disturbing gases

Ethanol, acetone, methane, nitrogen, nitric oxide, carbon monoxide, water vapor, isopropanol, freon R134A.

Maximum effect on readings:	CO_2 < 0.2 vol%; O_2, N_2O < 2 vol%; Anaesthetic agents < 0.15 vol%

Carbon dioxide (CO_2)

$EtCO_2$:	End-tidal CO_2 concentration
$FiCO_2$:	Inspired CO_2 concentration

CO_2 waveform

Measurement range:	0 to 15 vol% (0 to 15 kPa, 0 to 113 mmHg)
Accuracy:	± (0.2 vol% +2% of the reading)

GE Datex-Ohmeda infrared sensor

Adjustable low and high alarm limits for $EtCO_2$ and $FiCO_2$

Respiration rate (RR)

Measurement range:	4 to 100 breaths per minute
Detection criteria:	1% variation in CO_2
Accuracy:	±1 breaths per minute (at 4 to 20 breaths per minute)
	± 5% (at 20 to 100 breaths per minute)

Adjustable low and high alarm limits for respiration rate; alarm for apnea

Patient Oxygen (O_2)

FiO_2:	Inspired O_2 concentration
EtO_2:	End-tidal O_2 concentration
FiO_2-EtO_2:	Inspired-expired difference

O_2 waveform

Measurement range:	0 to 100 vol%
Accuracy:	± (1 vol% + 2% of the reading)

GE Datex-Ohmeda differential paramagnetic sensor

Adjustable low and high alarm limits for FiO_2 and EtO_2

Nitrous Oxide (N_2O)

Measurement range:	0 to 100 vol%
Accuracy:	± (2 vol% + 2% of the reading) (0%<N_2O<85%)

Anaesthetic Agent (AA)

Isoflurane and Enflurane

Measurement range:	0 to 6 vol%
Accuracy:	± (0.15 vol% + 5% of the reading)

Sevoflurane

Measurement range:	0 to 8 vol%
Accuracy:	± (0.15 vol% + 5% of the reading)

Desflurane

Measurement range:	0 to 20 vol%
Accuracy:	± (0.15 vol% + 5% of the reading)

Waveform displayed

MAC value displayed

Identification threshold:	0.15 vol %

Agent mixture detection

GE Datex-Ohmeda infrared sensor

Adjustable high and low alarm limits for EtAA and FiAA

Patient Spirometry

(available in GE Datex-Ohmeda Anaesthesia Monitor module bay)

Note: *For ventilation parameters reference the ventilator operating specifications*

Pressure-volume loop

Flow-volume loop

Pressure-flow loop

Airway pressure and flow waveforms

Adjustable low and high alarm limits for Ppeak and MVexp

Detection through Adult D-lite or D-lite(+) and Pediatric Pedi-lite or Pedi-lite(+) flow and gas sampling sensor with following specifications:

	D-lite and D-lite(+)	Pedi-lite and Pedi-lite(+)
Respiration rate:	4 to 35 bpm	4 to 70 bpm
Tidal volume		
Measurement range:	150 to 2000 mL	5 to 300 mL
Accuracy:	greater of (±6% or 30 mL)	greater of (±6% or 4 mL)
Minute volume		
Measurement range:	2 to 20 L/min	0.1 to 5 L/min
Airway pressure		
Measurement range:	-20 to +100 cmH_2O	-20 to +100 cmH_2O
Accuracy:	±1 cmH_2O	±1 cmH_2O
Display units:	cmH_2O, mmHg, kPa, mbar, hPa	
Flow		
Measurement range:	-100 to +100 L/min	-25 to +25 L/min
I:E		
I:E ratio:	1:4.5 to 2:1	
Compliance		
Measurement range:	4 to 100 ml/cmH_2O	1 to 100 ml/cmH_2O
Airway resistance		
Measurement range:	0 to 200 cmH_2O/L/s	

CARESCAPE Respiratory Modules *(continued)*

Sensor specifications

	D-lite and D-lite(+)	Pedi-lite and Pedi-lite(+)
Dead space:	9.5 mL	2.5 mL
Resistance:	at 30 L/min 0.5 cmH_2O	at 10 L/min 1.0 cmH_2O

Et Control**

Using CARESCAPE respiratory module E-sCAiOE or E-sCAiOVE, Et Control allows you to set the desired patient End Tidal Oxygen and End Tidal Agent concentrations. The Aisys CS^2 then automatically adjusts the fresh gas concentrations to quickly and efficiently achieve and maintain these End Tidal concentrations.

Isoflurane:	OFF, Purge, 0.2 - 2.5%, resolution 0.1%
Sevoflurane:	OFF, Purge, 0.2 - 4.0%, resolution 0.1%
Desflurane:	OFF, Purge, 1.0 - 12.0%, resolution 0.2%

When OFF is selected, no additional agent is added to the system and flows are controlled only based on End Tidal Oxygen concentration.

When Purge is selected, agent is driven out of the system as fast as possible by elevating fresh gas flows.

O_2 concentration range:	25 to 80%, Max

When Max is selected, the Aisys CS^2 will control the End Tidal Oxygen concentration as high as efficiently possible.

Flow range:	0.5 to 10 L/min, Minimum flow can be controlled by a user setting, 0.5 to 6 L/min

Compact Airway Modules

M-CAiO, M-CAiOV, M-CAiOVX module software version 3.2 or higher; E-CAiO, E-CAiOV, E-CAiOVX

Size (W x D x H):	7.5 x 22.8 x 11.2 cm/3.0 x 9.0 x 4.4 in
Weight:	1.6 kg/3.5 lb
Sampling rate:	200 ±20 mL/min

Automatic compensation for atmospheric pressure variation (500 to 800 mmHg) and CO_2/N_2O and CO_2/O_2 collision broadening effect.

Note: *For more details on Compact Airway Modules, reference the User Manual*

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Compact airway module gas exchange*

(available with Mgas or Egas Compact Airway Module in GE Datex-Ohmeda Anaesthesia Monitor module bay)

VO_2:	Oxygen consumption
VCO_2:	Carbon dioxide production
Measurement range:	50 to 1000 mL/min
Respiration rate range:	4 to 35 bpm (adults) 4 to 50 bpm (pediatric)

Compact airway module accuracy

FiO_2 < 65%:	±10% or 10 mL/min
65% < FiO_2 < 85%:	±15% or 15 mL/min

Detection through D-lite flow sensor or Pedi-lite flow and gas sampling sensor (see the measurement ranges and sensor specifications above).

Electrical Specifications

Current leakage

100/120 V:	< 300µA
220/240 V:	< 500µA

Power

Power input:	100-120 Vac, 50/60 Hz 220-240 Vac, 50/60 Hz
Power cord:	Length: 5 m/16.4 ft 10A @ 250 Vac or 15A @ 125 Vac

Battery backup

Backup power:	Demonstrated battery time under typical operating conditions is 90+ minutes when anaesthesia machine is fully charged. Battery time under extreme conditions is 30 minutes with monitor.
Battery type:	Internal rechargeable sealed lead acid

Inlet/outlet modules

100-120 V

System circuit breakers:	15A
Outlets:	4 outlets on back, 3-2A, 1-3A individual breakers, isolation transformer

220-240 V

System circuit breakers:	8A
Outlets (optional):	4 outlets on back, 3-1A, 1-2A individual breakers, isolation transformer

* Measurement not valid with O_2 and N_2O mixtures

Pneumatic Specifications

Auxiliary common gas outlet (optional)

Connector:	ISO 22 mm OD and 15 mm ID

Gas supply

Pipeline input range:	280 kPa to 600 kPa/ 41 psig to 87 psig
Pipeline connections:	DISS-male, DISS-female, DIN 13252, AS4059, BSPP 3/8, S90-116, or NIST
	All fittings available for O_2, N_2O, and Air, and contain pipeline filter and check valve
Cylinder input:	Pin indexed in accordance with CGA-V-1 or DIN (nut and gland); contains input filter and check valve

Note: *Maximum 3 cylinders*

Primary regulator diaphragm minimum burst pressure:	2758 kPa/400 psig
Primary regulator nominal output:	≤ 345 kPa/50 psig Pin indexed cylinder and ≤ 414 kPa/60 psig DIN cylinder connections

O_2 controls

Method:	N_2O shut off with loss of O_2 pressure
Supply failure alarm:	Range: < 252 kPa/37 psig
	Sounds at maximum volume every 10 seconds
O_2 flush:	Range: > 25 L/min

Alternate O_2 (safety flow)

Range:	500 mL/min minimum to 10 L/min
Indicator:	Flow tube
Indicator accuracy:	±5% full scale

Fresh gas

Flow range:	0 and 200 mL/min to 15 L/min (minimal flow capable)
Total flow accuracy:	±10% or ±40 mL/min of setting (whichever is greater)
O_2 flow accuracy:	±5% or ±20 mL/min of setting (whichever is greater)
Balance gas flow accuracy:	±5% or ±20 mL/min of setting (whichever is greater) Air/N_2O
O_2 concentration range:	21% to 100% (when Air is available)
O_2 concentration accuracy:	±5% V/V for flows < 1 L/min* ±2.5% setting for flows > 1 L/min
Electronic mixer response time:	500 msec (10% to 90% flow step)
Compensation:	Temperature and atmospheric pressure compensated to standard conditions of 20°C and 101.3 kPa
Hypoxic guard:	Electronic

Materials

All materials in contact with patient breathing gases are not made with natural rubber latex

Environmental Specifications

System operation

Temperature:	10° to 35°C/50° to 95°F
Humidity:	15 to 95% relative humidity (non-condensing)
Altitude:	-440 to 3000 m/ 537 to 800 mmHg

System storage

Temperature:	-25° to 60°C/-13° to 140°F
Humidity:	15 to 95%
Altitude:	-440 to 4880 m/ 425 to 800 mmHg
Oxygen cell storage:	-15° to 50°C/5° to 122°F 10 to 95% relative humidity 500 to 800 mmHg

Electromagnetic compatibility

Immunity:	Complies with all requirements of EN 60601-1-2
Emissions:	CISPR 11 Group 1 Class A
Approvals:	AAMI ES60601-1, CSA C22.2 #601.1, EN/IEC 60601-1, ISO 80601-2-13

* The stated concentration accuracy may not be met for total flows between 200 and 400 mL/min. At least 21% O_2 will be maintained.

Breathing Circuit Specifications

Operational modes

Breathing circuit is circle mode; SCGO option converts to open circuit mode

Carbon dioxide absorbent canister

Absorbent capacity:	800 g

Integrated expiratory limb water reservoír

Ports and connectors

Exhalation:	22 mm OD ISO/15 mm ID taper
Inhalation:	22 mm OD ISO/15 mm ID taper
Bag port:	22 mm OD/22 mm ID (Australia)

Bag-to-Ventilator switch

Type:	Bi-stable
Control:	Controls ventilator and direction of breathing gas within the circuit

Integrated Adjustable Pressure Limiting (APL) valve

Range:	0.5 to 70 cmH_2O
Range of rotation:	0.5 to 30 cmH_2O (0 to 230°) 30 to 70 cmH_2O (230 to 330°)

Materials

All materials in contact with exhaled patient gases are autoclavable, except disposable flow sensors, O_2 cell, and Respiratory Modules. (Autoclavable flow sensors optional)

All materials in contact with patient gas are not made with natural rubber latex.

Breathing circuit parameters

Compliance:	Bag mode: 1.82 mL/cmH_2O

Expiratory resistance:

Flow rate	*P_{exp} Bag Mode Pressure drop*	*P_{exp} Vent Mode Pressure drop*
5 L/min	0.46 cmH_2O	0.46 cmH_2O
30 L/min	1.47 cmH_2O	1.55 cmH_2O
60 L/min	3.80 cmH_2O	4.09 cmH_2O

Note: *Values include patient circuit tubing and wye piece (0.3 cmH_2O at 60 L/min)*

Anaesthetic gas scavenging

AGSS Type	*Hospital extract system required*	*Machine connection*
High vacuum, low flow with indicator:	High vacuum 36 L/min @ 12 in Hg (305 mmHg)	DISS evac
High vacuum, variable flow with bag indicator:	High vacuum 30 L/min extract flow @ 12 in Hg (305 mmHg)	DISS evac
Passive:	Passive or external active system with air break	30 mm/1.2 in M ISO taper

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