Avance* CS²
Precise care.
With a personal touch.

Features
- Movable 15” touch screen with CARESCAPE* user interface for the unified CARESTATION* user experience with GE CARESCAPE monitors
- ecoFLOW provides information that may help clinicians mitigate the risk of hypoxic mixtures during low and minimum flow
- ecoFLOW for visualizing agent consumption and help in mitigating wasteful over delivery of fresh gas flow
- User configurable ‘Quick Picks’ for rapid selection of FiO₂ and total flow combinations

Ventilation Options
- With ‘Flow Power Inside’ our ventilator engine can ventilate all patient types from neonates to large adults
- Sophisticated mechanical ventilation and assisted ventilation options including synchronised PCV-VG with pressure support (SIMV PCV-VG) and minimum rate ventilation (CPAP+PSV)
- Vital capacity and Cycling lung ventilation procedures

Advanced Breathing System (ABS*)
- Compact breathing system specifically designed for low flow to help provide fast gas kinetics for rapid wash-in and wash-out
- Continual fresh gas flow with fresh gas flow compensation during mechanical ventilation

Exceptional Design
- Central brake
- Top shelf mounting rails
- Metal work surface
- Movable display arm for inbound and outboard positioning
- Two or three vaporiser positions
- Bi-level work surface illumination
**Physical Specifications**

**Dimensions**
- Height: 139 cm
- Width: 77 cm
- Depth: 76 cm
- Weight: 147 kg

**Top shelf**
- Weight limit: 34 kg/75 lb
- Width: 69.7 cm
- Depth: 44 cm

**Work surface**
- Height: 81.7 cm/32.2 in
- Size: 2640 cm²/409 in²

**Upper left GCX/DO dovetail**
- GCX length: 13.2 cm
- DO dovetail length: 23.2 cm

**Upper right DO dovetail**
- Length: 34 cm

**Lower right GCX rail**
- Length: 41 cm

**Drawers (internal dimensions)**
- Height: 17.5 cm/6.9 in
- Width: 33 cm/13 in
- Depth: 26.5 cm/10.4 in

**Absorber bag arm (optional)**
- Arm length: 39.8 cm/15.7 in
- Bag arm height (adjustable): 87 cm/34.3 in, 113 cm/44.4 in

**Casters**
- Diameter: 13 cm
- Brakes: Central Brake

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**Ventilator Operating Specifications**

**Modes of ventilation – standard**
- VCV (Volume Control) Mode with tidal volume compensation

**Modes of ventilation – optional**
- Pressure Control
- Pressure Controlled Ventilation-Volume Guaranteed (PCV-VG)
- SIMV (Synchronized Intermittent Mandatory Ventilation) (volume and pressure)
- PSVPro* (Pressure Support with Apnea backup)
- CPAP+PSV (Pressure support mode)
- SIMV PCV-VG

**Ventilator parameter ranges**
- **Tidal volume range:** Less than 0.1 to 99.9 L/min
- **Pressure \(P_{\text{inspired}}\) range:** 5 to 60 cmH\(_2\)O (increments of 1 cmH\(_2\)O)
- **Pressure \(P_{\text{max}}\) range:** 12 to 100 cmH\(_2\)O (increments of 1 cmH\(_2\)O)
- **Pressure \(P_{\text{support}}\) range:** Off, 2 to 40 cmH\(_2\)O (increments of 1 cmH\(_2\)O)

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1 Excludes vaporisers, airway gas module and patient monitor.
Rate: 4 to 100 breaths per minute for Volume Control and Pressure Control; 2 to 60 breaths per minute for SIMV, PSVPro and SIMV PCV-VG; 4 to 60 bpm for CPAP+PSV (increments of 1 breath per minute)

Inspiratory/expiratory ratio: 2:1 to 1.8 (increments of 0.5)

Inspiratory time: 0.2 to 5.0 seconds (increments of 0.1 seconds) (SIMV, PSVPro 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%)

Inspiratory Pause range: 0-60%

Positive End Expiratory Pressure (PEEP)
Type: Integrated, electronically controlled
Range: OFF, 4 to 30 cmH2O (increments of 1 cmH2O)

Ventilator performance
Pressure range at inlet: 240 kPa to 700 kPa (35 psig to 100 psig)
Peak gas flow: 120 L/min + fresh gas flow
Flow valve range: 1 to 120 L/min
Flow compensation range: 150 mL/min to 15 L/min

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 cmH2O
PEEP delivery: ±1.5 cmH2O

Inspired oxygen (FiO2): Low: 18 to 99% High: 19 to 100%, OFF

Apnea alarm: Mechanical ventilation ON: < 5 mL breath measured in 30 seconds Mechanical ventilation OFF: < 5 mL breath measured in 30 seconds

Low airway pressure: 4 cmH2O above PEEP
High pressure: 12 to 100 cmH2O (increments of 1 cmH2O)

Sustained airway pressure: Mechanical ventilation ON: Pmax < 30 cmH2O, the sustained limit is 6 cmH2O Pmax 30 to 60 cmH2O, the sustained limit is 20% of Pmax Pmax > 60 cmH2O, the sustained limit is 12 cmH2O PEEP and mechanical ventilation ON Sustained limit increases by PEEP minus 2 cmH2O

Subatmospheric pressure: Paw < -10 cmH2O

Audio pause countdown clock: 120 to 0 seconds

Alarm settings
Tidal volume (VTE): Low: OFF, 1 to 1500 mL High: 20 to 1600 mL, OFF

Minute volume (Vg): Low: OFF, 0.1 to 10 L/min High: 0.5 to 30 L/min, OFF

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 Airway Module option
Non-disturbing gases:
Ethanol, acetone, methane, nitrogen, nitric oxide, carbon monoxide, water vapor:
Maximum effect on readings: $\text{CO}_2 < 0.2 \text{ vol } \%$; $\text{O}_2, \text{N}_2\text{O} < 2 \text{ vol } \%$

**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% (0 to 15 kPa, 0 to 113 mmHg)
- Accuracy: $\pm 0.2 \text{ vol } \% + 2 \%$ of reading

Datex-Ohmeda infrared sensor
Adjustable low and high alarm limits for EtCO$_2$ and FiCO$_2$

**Respiration rate (RR)**

- Measurement range: 4 to 60 breaths/min for E-, M-series modules
- Detection criteria: 1% variation in CO$_2$
- 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$_2$ Measurement**

- Measurement range: 0 to 100%
- Accuracy: $\pm 1 \text{ vol } \% + 2 \%$ of reading

Datex-Ohmeda differential paramagnetic sensor
Adjustable low and high alarm limits for FiO$_2$ and EtO$_2$; alarm for FiO$_2 < 18\%$

**Nitrous Oxide (N$_2$O)**

- Measurement range: 0 to 100%
- Accuracy: $\pm 2 \text{ vol } \% + 2 \%$ of reading

**Anesthetic Agent (AA)**

- **Halothane, Isoflurane, Enflurane**
  - Measurement range: 0 to 6%
  - Accuracy: $\pm 0.15 \text{ vol } \% + 5\%$ of reading

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**Ventilator screen**

- Display size: 15 inch
- Pixel format: 1024 x 768

**Battery backup**

- Backup power: Demonstrated battery time is up to 90 minutes when fully charged.
  Battery time under extreme conditions is 30 minutes.
- Battery type: Internal rechargeable sealed lead acid

**Communication ports**

- RS-232C compatible serial interface
- Ethernet
- Datex-Ohmeda device interface solutions port
- USB port
- VGA Output

**Anesthetic Agent Delivery**

**Delivery**

- Vaporizers: Tec* 6 Plus, Tec 7
- Number of positions: 2 (3 as an option)
- Mounting: Tool-free installation Selectatec* manifold interlocks and isolates vaporizers

**Airway Modules**

**General**

- M-CAIO, M-CAIOV, M-CAIOVX module software version 3.2 or higher; E-CAIO, ECAIOV, E-CAIOVX
- Size (WxDxH): $75 \times 228 \times 112 \text{ mm}/3.0 \times 9.0 \times 4.4 \text{ in}$
- Weight: 1.6 kg/3.5 lb
- Sampling rate: 200 mL/min $\pm 20 \text{ mL}$
- E-sCAIO, E-sCAIOV
  - Size (WxDxH): $38 \times 205 \times 113 \text{ mm}/1.5 \times 8.1 \times 4.4 \text{ in}$
  - Weight: 0.7 kg/1.5 lb
  - Sampling rate: 120 mL/min $\pm 20 \text{ mL}$

Automatic compensation for atmospheric pressure variation (500 to 800 mmHg for E-, M-series modules; 495 to 795 mmHg for CARESCAPE modules) temperature and CO$_2$/N$_2$O and CO$_2$/O$_2$ collision broadening effect. Parameter display update interval typically breath-by-breath. Functional alarms for blocked sample line, D-fend check and D-fend replacement.
Sevoflurane
Measurement range: 0 to 8%
Accuracy: ±(0.15 vol% +5% of reading)

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

Waveform displayed
MAC value displayed
Identification threshold: 0.15 vol %
Agent mixture detection
Adjustable high and low alarm limits for EtAA, FiAA

Patient Spirometry*
Pressure-volume loop
Pressure-flow loop
Flow-volume loop
Airway pressure and flow waveforms
Adjustable low and high alarm limits for $P_{peak}$, PEEP$_{tot}$ and $MV_{exp}$
Alarms for $MV_{exp} < MV_{insp}$ and for $MV_{exp}$ low. Detection through D-lite* or Pedi-lite* flow sensor and gas sampler with following specifications:

Compact Airway Modules

<table>
<thead>
<tr>
<th></th>
<th>D-lite</th>
<th>Pedi-lite</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiration rate:</strong></td>
<td>4 to 35 breaths/min</td>
<td>4 to 50 breaths/min</td>
</tr>
<tr>
<td><strong>Tidal volume</strong></td>
<td>150 to 2000 mL</td>
<td>15 to 300 mL</td>
</tr>
<tr>
<td><strong>Measurement range:</strong></td>
<td>±6% or 30 mL</td>
<td>±6% or 4 mL</td>
</tr>
<tr>
<td><strong>Accuracy</strong>:</td>
<td>4 to 35 breaths/min</td>
<td>4 to 50 breaths/min</td>
</tr>
<tr>
<td><strong>Minute volume</strong></td>
<td>2 to 20 L/min</td>
<td>0.5 to 5 L/min</td>
</tr>
<tr>
<td><strong>Accuracy</strong>:</td>
<td>±6%</td>
<td>±6%</td>
</tr>
<tr>
<td><strong>Airway pressure</strong></td>
<td>-20 to +100 cmH$_2$O</td>
<td>±1 cmH$_2$O</td>
</tr>
<tr>
<td><strong>Display units</strong>:</td>
<td>cmH$_2$O, mmHg, kPa, mbar, hPa</td>
<td>cmH$_2$O, mmHg, kPa, mbar, hPa</td>
</tr>
<tr>
<td><strong>Flow</strong></td>
<td>-100 to 100 L/min</td>
<td>-25 to 25 L/min</td>
</tr>
<tr>
<td><strong>I:E</strong></td>
<td>1:4.5 to 2:1</td>
<td>1:4.5 to 2:1</td>
</tr>
<tr>
<td><strong>Compliance</strong></td>
<td>4 to 100 mL/cmH$_2$O</td>
<td>1 to 100 mL/cmH$_2$O</td>
</tr>
<tr>
<td><strong>Airway resistance</strong></td>
<td>0 to 200 cmH$_2$O/L/s</td>
<td>0 to 200 cmH$_2$O/L/s</td>
</tr>
</tbody>
</table>

CARESCAPE Airway Modules

<table>
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<tr>
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<th>D-lite(+)</th>
<th>Pedi-lite(-)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiration rate:</strong></td>
<td>4 to 35 breaths/min</td>
<td>4 to 70 breaths/min</td>
</tr>
<tr>
<td><strong>Tidal volume</strong></td>
<td>150 to 2000 mL</td>
<td>5 to 300 mL</td>
</tr>
<tr>
<td><strong>Measurement range:</strong></td>
<td>±6% or 30 mL</td>
<td>±6% or 4 mL</td>
</tr>
<tr>
<td><strong>Accuracy</strong>:</td>
<td>4 to 35 breaths/min</td>
<td>4 to 50 breaths/min</td>
</tr>
<tr>
<td><strong>Minute volume</strong></td>
<td>2 to 20 L/min</td>
<td>0.1 to 5 L/min</td>
</tr>
<tr>
<td><strong>Accuracy</strong>:</td>
<td>±6%</td>
<td>±6%</td>
</tr>
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<td><strong>Airway pressure</strong></td>
<td>-20 to +100 cmH$_2$O</td>
<td>±1 cmH$_2$O</td>
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<td><strong>Display units</strong>:</td>
<td>cmH$_2$O, mmHg, kPa, mbar, hPa</td>
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<td>1 to 100 mL/cmH$_2$O</td>
</tr>
<tr>
<td><strong>Airway resistance</strong></td>
<td>0 to 200 cmH$_2$O/L/s</td>
<td>0 to 200 cmH$_2$O/L/s</td>
</tr>
</tbody>
</table>

Sensor specifications

<table>
<thead>
<tr>
<th></th>
<th>D-lite/ D-lite(+)</th>
<th>Pedi-lite/ Pedi-lite(+)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dead space</strong></td>
<td>9.5 mL</td>
<td>2.5 mL</td>
</tr>
<tr>
<td><strong>Resistance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 30 L/min:</td>
<td>0.5 cmH$_2$O</td>
<td>1.0 cmH$_2$O</td>
</tr>
<tr>
<td>at 10 L/min:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Typical value
Electrical Specifications

Current leakage

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Leakage (μA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100/120 V</td>
<td>&lt; 300μA</td>
</tr>
<tr>
<td>220/240 V</td>
<td>&lt; 500μA</td>
</tr>
</tbody>
</table>

Power

<table>
<thead>
<tr>
<th>Power Input</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-120 Vac, 50/60 Hz</td>
<td>10A @ 250 Vac or 15A @ 125 Vac</td>
</tr>
<tr>
<td>220-240 Vac, 50/60 Hz</td>
<td></td>
</tr>
</tbody>
</table>

Power cord:
- Length: 5 m/16.4 ft
- Rating: 10A @ 250 Vac or 15A @ 125 Vac

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

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, AS4059, BSPP 3/8, S90-116, or NIST
- All fittings available for O₂, N₂O, 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 connections ≤ 414 kPa/60 psig
DIN cylinder connections

O₂ controls

- Method: N₂O shut off with loss of O₂ pressure
- Supply failure alarm: < 252 kPa (36.55 psig)
- O₂ flush: Range: > 25 L/min

Alternate O₂ (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 150 mL/min to 15 L/min (minimal flow capable)
- Total flow accuracy: ±10% or ±40 mL/min of setting (larger of)
- O₂ flow accuracy: ±5% or ±20 mL/min of setting (larger of)
- Balance gas flow accuracy: ±5% or ±20 mL/min of setting (larger of)
- O₂ concentration range: 21% to 100% when Air is available
- O₂ concentration accuracy:
  - 2.5% (Total Flow ≤ 15 L/min)
  - 5% (Total Flow < 1 L/min)
  - 6.5% (Total Flow < 0.4 L/min)
- Electronic mixer response time: 500ms (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 from natural rubber latex.
Environmental Specifications

Integrated Adjustable Pressure Limiting (APL) valve

Range: 0.5 to 70 cmH₂O
Tactile knob indication at: 30 cmH₂O and above
Adjustment range of rotation: 0.5 to 30 cmH₂O (0 to 230°)
30 to 70 cmH₂O (230 to 330°)

Materials
All materials in contact with exhaled patient gases are autoclavable, except disposable flow sensors, O₂ cell, and Airway Modules. (Autoclavable flow sensors optional)
All materials in contact with patient gas are not made from natural rubber latex.

Breathing circuit parameters

Compliance: Bag mode: 1.82 mL/cmH₂O
Mechanical mode: Automatically compensates for compression losses within the absorber and bellows assembly

Total circuit volume: 2.7 L Vent Mode
1.2 L Bag Mode

Note: Includes Absorber volume

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 reservoir

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

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

AGSS Type
High vacuum, low flow with indicator: DISS evac
36 L/min @ 12 in Hg (305 mmHg)

Hospital extract system required

Machine connection
High vacuum, variable flow with bag indicator: DISS evac
High vacuum 30 L/min extract flow @ 12 in Hg (305 mmHg)

Passive: Passive or external active system with air break
30 mm/1.2 in M ISO taper

Breathing Circuit Parameters

Compliance: Bag mode: 1.82 mL/cmH₂O
Mechanical mode: Automatically compensates for compression losses within the absorber and bellows assembly

Total circuit volume: 2.7 L Vent Mode
1.2 L Bag Mode

Note: Includes Absorber volume

Expiratory resistance:

<table>
<thead>
<tr>
<th>Flow rate</th>
<th>Bag Mode Pressure drop</th>
<th>Vent Mode Pressure drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 L/min</td>
<td>0.46 cmH₂O</td>
<td>0.46 cmH₂O</td>
</tr>
<tr>
<td>30 L/min</td>
<td>1.47 cmH₂O</td>
<td>1.55 cmH₂O</td>
</tr>
<tr>
<td>60 L/min</td>
<td>3.80 cmH₂O</td>
<td>4.09 cmH₂O</td>
</tr>
</tbody>
</table>

Note: Values include patient circuit tubing and wye piece (0.3 cmH₂O at 60 L/min)

Anesthetic gas scavenging

AGSS Type
High vacuum, low flow with indicator: DISS evac
36 L/min @ 12 in Hg (305 mmHg)

Hospital extract system required

Machine connection
High vacuum, variable flow with bag indicator: DISS evac
High vacuum 30 L/min extract flow @ 12 in Hg (305 mmHg)

Passive: Passive or external active system with air break
30 mm/1.2 in M ISO taper
Healthcare Re-imagined

GE is dedicated to helping you transform healthcare delivery by driving critical breakthroughs in biology and technology. Our expertise in medical imaging and information technologies, medical diagnostics, patient monitoring systems, drug discovery, and biopharmaceutical manufacturing technologies is enabling healthcare professionals around the world discover new ways to predict, diagnose and treat disease earlier. We call this model of care “Early Health.” The goal: to help clinicians detect disease earlier, access more information and intervene earlier with more targeted treatments, so they can help their patients live their lives to the fullest. Re-think, Re-discover, Re-invent, Re-imagine.

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