Carestation™ 650

The Carestation 650 is a compact, versatile and easy to use anesthesia system designed to help clinicians deliver reliable anesthesia care to solve today's toughest challenges.

Key Features

- Elegant modern design in a slim, compact frame well suited for constrained environments
- Simple and easy to use 15" touchscreen ventilator display
- Intuitive CARESCAPE™ inspired user interface for the unified Carestation user experience
- Integrated CARESCAPE Respiratory Module
- Time saving tools to help streamline clinician workload
- Scalable software and hardware features: "build your own" Carestation
- ecoFLOW display option may help clinicians mitigate the risk of hypoxic mixtures while helping to reduce agent use by using low and minimum flows with continuous gas monitoring

Ventilation

- Small, compact breathing system specifically designed for low flow anesthesia
- Fast gas kinetics for rapid wash-in and wash-out
- Digitally controlled flow valve ventilator supports all patient types from neonates to adults
- Advanced ventilation options including synchronized PCV-VG with pressure support (SIMV PCV-VG) and minimum rate ventilation (CPAP+PSV)
- Software enabled tools including Vital Capacity and Cycling Procedures to help automate repetitive tasks used during lung ventilation procedures
- Continual fresh gas flow with fresh gas flow compensation during mechanical ventilation

Design

- Durable wheels, handles and central brake for mobility and stability
- Robust handles and mounting rails
- Easy to clean surfaces
- Movable display arm that rotates and tilts for ideal positioning
- Two vaporizer configuration
- Bi-level work surface illumination
- Absorbent canister designed for ease of use and long life
- Intelligent lighting that highlights active flow controls and auxiliary ports when in use

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Physical Specifications

Product Description

Carestation 650 A1

Dimensions

Height:	135 cm/53.1 in
Width:	82.5 cm/32.4 in
Depth:	75 cm/29.5 in
Weight:	145 kg/320 lb*

Top shelf

Weight limit:	25 kg/55 lb
Width:	41.3 cm/16.3 in
Depth:	27.0 cm/10.6 in

Work surface

Height:	83.6 cm/32.9 in
Size:	1930 cm^2/299 in^2
Size: (with optional flip shelf)	2950 cm^2/471 in^2

Upper left Datex-Ohmeda (DO) dovetail

Dovetail length:	54 cm/21.3 in

Lower left Datex-Ohmeda (DO) dovetail

Dovetail length:	28 cm/11.0 in

Right Datex-Ohmeda (DO) dovetail

Dovetail length:	96.4 cm/38.0 in

Drawers (internal dimensions)

Height:	
Top and middle:	8.6 cm/3.4 in
Bottom:	13.3 cm/5.2 in
Width:	34 cm/13 in
Depth:	37 cm/14.6 in

Manual ventilation bag arm (optional)

Arm length:	39.8 cm/15.7 in
Bag arm height (adjustable):	53 cm/20.9 in
	136 cm/53.5 in

Casters

Diameter:	12.5 cm/4.9 in
Brakes:	Central Brake
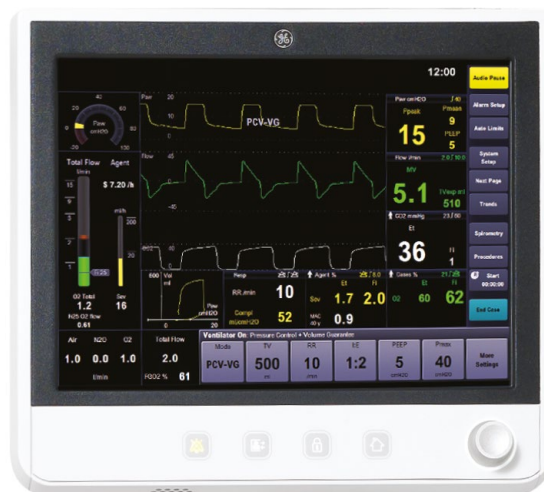
Ventilator Operating Specifications

Modes of ventilation – included

VCV (Volume Control) Mode with tidal volume compensation

Modes of ventilation – optional

PCV (Pressure Control Ventilation)

PCV-VG (Pressure Controlled Ventilation-Volume Guarantee)

SIMV (Synchronized Intermittent Mandatory Ventilation) (volume and pressure)

PSVPro™ (Pressure Support with Apnea backup)

CPAP+PSV (Pressure support mode)

SIMV PCV-VG

Advanced software options

Spirometry (included)

Auto alarm limits (included)

ecoFLOW

Pause Gas

Vital capacity and cycling

VCV Cardiac Bypass

Excludes vaporizers, airway gas module, patient monitor and wall mount bracket.

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Ventilator parameter ranges

Tidal volume range:	5 to 1500ml (PCV modes 5 to 1500ml) (Volume Control, PCV-VG and SIMV volume 20 to 1500ml)
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) above set PEEP
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)
Respiratory 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) (VCV, PCV, PCV-VG)
Inspiratory time:	0.2 to 5.0 seconds (increments of 0.1 seconds) (SIMV, PSVPro and CPAP PSV)
Trigger window:	Off, 5 to 80% of Texp (SIMV, PSVPro) (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:	Off, 5-60% of Tinsp

Positive End Expiratory Pressure (PEEP)

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

Ventilator performance

Peak gas flow:	120 L/min + fresh gas flow
Flow valve range:	1 to 120 L/min
Flow compensation range:	100 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 cmH_2O (larger of)
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 ±2.4 cmH_2O (larger of)

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 30 seconds *Mechanical ventilation OFF:* < 5 mL breath measured in 30 seconds
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} 12 to 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
Audio pause countdown clock:	120 to 0 seconds

Ventilator Components

Flow transducer

Type:	Variable orifice flow sensor (autoclavable)
Location:	Inspiratory outlet and expiratory inlet

Oxygen sensor

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

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
Mounting:	Tool-free installation Selectatec™ manifold interlocks and isolates vaporizers

Airway Modules

General

E-sCAiO, E-sCAiOV, N-CAiO

Size (HxWxD), excluding water trap:	113 x 38 x 205 mm/4.4 x 1.5 x 8.1 in
Weight:	0.7 kg/1.5 lb
Sampling rate:	120 mL/min ±20 mL

Automatic compensation for atmospheric pressure variation (495 to 795 mmHg) temperature and CO_2/N_2O 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.

Non-disturbing gases:

Ethanol, acetone, isopropanol, methane, nitrogen, nitric oxide, carbonmonoxide, water vapor, freon R134A (for CO_2, O_2 and N_2O):

Maximum effect on readings:	CO_2 < 0.2 vol %; O_2, N_2O < 2 vol %, AA < 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% (0 to 15 kPa, 0 to 113 mmHg)
Accuracy:	±0.2 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 100 breaths/min
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:	±1 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: ±2 vol % +2 % of reading

Anesthetic Agent (AA)

Halothane, Isoflurane, Enflurane
Measurement range: 0 to 6%
Accuracy: ±(0.15 vol% +5% of reading)

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 (Airway Gas Option modules)
MACage value displayed (CARESCAPE modules)
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:

CARESCAPE Airway Modules

	D-lite(+)	Pedi-lite(+)
Respiration rate:	4 to 35 breaths/min	4 to 70 breaths/min

Tidal volume
Measurement range:	150 to 2000 mL	5 to 300 mL
Accuracy**:	±6% or 30 mL	±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$_2$O
Accuracy**: ±1 cmH$_2$O
Display units: cmH$_2$O, mmHg, kPa, mbar, hPa

Flow
Measurement range:	-100 to 100 L/min	-25 to 25 L/min

I:E
Measurement range: 1:4.5 to 2:1

Compliance
Measurement range:	4 to 100 mL/cmH$_2$O	1 to 100 mL/cmH$_2$O

Airway resistance
Measurement range: 0 to 200 cmH$_2$O/L/s

Sensor specifications

	D-lite/ D-lite(+)	Pedi-lite/ Pedi-lite(+)
Dead Space:	9.5 mL	2.5 mL

Resistance
at 30 L/min:	0.5 cmH$_2$O	
at 10 L/min:		1.0 cmH$_2$O

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
120/220-240 Vac ± 10%, 50-60 Hz

Power cord:
  Length: 5 m/16.4 ft
  Rating: 10A @ 220-240 Vac or 15A @ 100-120 Vac 10A @ 120/220-240 Vac

Inlet modules

100/120 V:
  Without outlets: 2A
  With outlets: 10A
220/240 V:
  Without outlets: 1A
  With outlets: 5A

Outlet modules (optional)

100/120 V:
  3 outlets on side 3-2A individual breakers, isolation transformer (optional)

220/240 V:
  3 outlets on side 3-1A individual breakers, isolation transformer (optional)

120/220-240 V:
  No outlets

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**Typical value* 5

Pneumatic Specifications

Auxiliary O$_2$ (optional)

Connection:	7-10 mm hose barb port
O$_2$ concentration range:	100% O$_2$
Flow range:	0 to >10 L/min

Auxiliary O$_2$+Air (optional)

Connection:	7-10 mm hose barb port
O$_2$ concentration range:	100% O$_2$ only, or 21% to 100% O$_2$ with Air
Flow range: for O$_2$ and Air:	0 and 100 mL/min to 15 L/min

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 O$_2$, N$_2$O, and Air, and contain pipeline filter and check valve.
	Secondary O$_2$ pipeline inlet available.
Cylinder input:	Pin indexed in accordance with CGA-V-1 or DIN-477 (nut and gland); contains input filter and check valve.
	Large cylinder kit available for O$_2$ and N$_2$O (with DIN-477).

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-477 cylinder connections

O$_2$ controls

Method:	N$_2$O shut off with loss of O$_2$ pressure
Supply failure alarm:	< 252 kPa (36.55 psig)
O$_2$ flush:	Range: 25 to 75 L/min

Fresh gas

Flow range: for O$_2$ and Air:	0 and 100 mL/min to 15 L/min (minimal flow capable)
for N$_2$O:	0 and 100 mL/min to 10 L/min

Pneumatic Total Flow Tube:	1 to 10 L/min
Measurement accuracy for O$_2$, Air and N$_2$O:	±6% of measured value, or ±25 mL/min (larger of)
for Total Flow tube:	±5% of full scale (larger of) at 100% O$_2$
O$_2$ concentration range:	21% to 100% when Air is available
O$_2$ Cell accuracy:	±2.5% plus 2.5% of reading
Compensation:	Temperature and atmospheric pressure compensated to standard conditions of 20°C and 101.3 kPa
Hypoxic guard:	Mechanical Link-25: Provides a nominal minimum 25% concentration of oxygen in O$_2$/N$_2$O mixture.

Materials

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

Environmental Specifications

System operation

Temperature:	10° to 40°C (50° to 104°F)
Humidity:	15 to 95% relative humidity (non-condensing)
Altitude:	-440 to 3565 m (500 to 800 mmHg)

System storage

Temperature:	-25° to 60°C (-13° to 140°F)
Humidity:	15 to 95% relative humidity (non-condensing)
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 applicable 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
European Notified Body CE Mark:	CE0197

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Breathing Circuit Specifications

Carbon dioxide absorbent canister

Absorbent capacity:	Reusable canister 1370 mL/1150 g
	Disposable canister 1437 mL/1200 g

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 (15 mm ID), ROW
	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
Tactile knob indication at:	30 cmH_2O and above
Adjustment 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 O_2 cell, and Airway Modules.
All materials in contact with patient gas are not made from natural rubber latex.

Breathing circuit parameters

Compliance:	
Bag mode:	1.81 mL/cmH_2O
	(filled disposable absorber canister)
	1.74 mL/cmH_2O
	(filled reusable absorber canister)
Mechanical mode:	Automatically compensates for compression losses within the absorber and bellows assembly
Volume:	2006 mL Ventilator side
	500 mL Bag side
	1004 mL Reusable canister
	985 mL Disposable canister

Expiratory resistance in bag mode:

Flow rate	P_{exp} Absorber canister Installed	P_{exp} Absorber canister Removed
5 L/min	0.57 cmH_2O	0.57 cmH_2O
30 L/min	2.47 cmH_2O	2.47 cmH_2O
60 L/min	5.60 cmH_2O	5.60 cmH_2O

Note: *Values include patient circuit tubing and wye piece (0.65 cmH_2O at 60 L/min)*

Anesthetic gas scavenging

AGSS Type	Hospital extract system required	Machine connection
High vacuum, low flow:	High vacuum 36 L/min @ 12 in Hg (305 mmHg)	SIS evac
High vacuum, low flow:	High vacuum 25- 30 L/min @ 12 inHg (305 mmHg)	DISS evac
Low vacuum, high flow:	Low vacuum 55 to 65 L/min	BSI 30 mm threaded
Low vacuum, low flow:	36 L/min	12.7 mm hose barb, 25 mm hose barb, or 30 mm ISO taper
Passive:	Passive system with air break	30 mm/1.2 in M ISO taper

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Imagination at work

Distributed by:
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GE Direct United Kingdom: +44 (0)800 0329201

www.gehealthcare.com.

Manufactured by:
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DOC1649438 Rev2 6/15

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