GE HealthCare

Carestation 850 Anaesthesia Delivery System

The Carestation™ 850 is the next-generation anaesthesia machine that is designed to adapt to your evolving needs. Smart tools and customizable applications help you enhance clinical precision for your patients, while a large display features a user-friendly interface and clear data visualization. A small footprint with great flexibility allows you to comfortably position your widescreen display anywhere care happens, and you can deliver anaesthesia uninterrupted with its new vaporization platform. Designed to grow with you through continuously optimized algorithms and adaptable technologies, the Carestation 850 anaesthesia delivery system is backed by expert service from GE HealthCare. Effortless updates and remote support ensure your anaesthesia machine is operating smoothly, so you can focus on patient care.

Key features

- Modern, premium, compact design for an optimized workspace utilization
- Simple and easy-to-use 22" touchscreen ventilator display
- Intuitive user interface, inspired by the GE HealthCare's Carescape™ monitors, makes for a seamless experience in the OR
- Integrated Carescape Respiratory Module
- ecoFLOW software helps support clinicians in the practice of low-flow anaesthesia by predicting how much O2 is needed within the fresh gas flow
- Et Control* software automatically adjusts fresh gas concentrations to quickly and efficiently achieve and maintain end tidal oxygen and end tidal agent targets
- Electronic gas mixer and electronic vaporizers
- Device connectivity with multiple configurable network ports
- Features multiple protocols, including HL7® and SBX
- Ability to time sync from the hospital network
- Embedded service management interface with remote diagnostics

Shown with the Carescape Canvas monitor.

* Not available in all markets.

Ventilation

- Small, compact breathing system (CBS) specifically designed for low-flow anaesthesia
- Fast gas kinetics for rapid wash-in and wash-out
- Digitally controlled, flow valve ventilator to support 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)
- Lung protective ventilation tools, including:
  - Single-step and multi-step lung recruitment maneuvers to optimize clinical outcomes, while reducing workloads for clinicians
  - Predicted body weight calculator
  - Driving pressure monitoring
- Continual fresh gas flow with fresh gas flow compensation during mechanical ventilation

Design

- Ergonomic form factor for seamless and efficient workflow and serviceability
- Innovative cable management solution to organize power cables and gas hoses and to simplify installation, cleaning and transportability
- Easy to clean surfaces
- Extendable, tiltable, swiveling display arm for flexible positioning to stay close to the patient
- 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

Physical specifications

Dimensions

Height	147 cm/57.9 in
Width	90 cm/35.4 in
Depth	81.5 cm/32.1 in
Weight*	178 kg/393 lb

Top Shelf

Weight limit:	25 kg/55 lb
Width:	41.3 cm/16.3 in
Depth:	38.8 cm/15.3 in

Work surface

Height:	83.6 cm/32.9 in
Size:	1620 cm^2 /251 in^2
Size:	2527 cm^2/392 in^2 (with optional flip shelf)

Upper left Datex-Ohmeda (DO) dovetail

Dovetail length:	49 cm/19.3 in

Lower left Datex-Ohmeda (DO) dovetail

Dovetail length:	32 cm/12.6 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:	15.7 cm/6.2 in
Width:	34 cm/13 in
Depth:	
Top and middle:	37 cm/14.6 in
Bottom:	19.5 cm/7.7 in

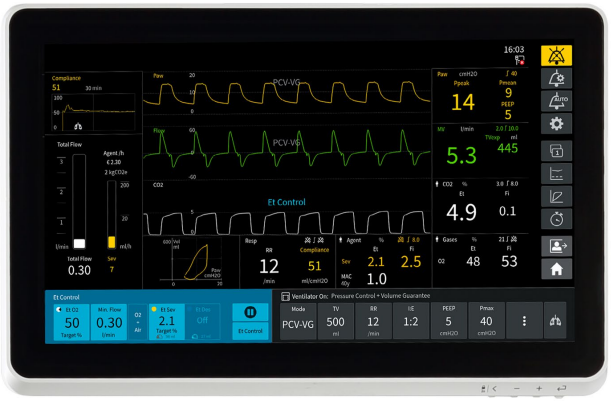
Manual ventilation bag arm (optional)

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

* Excludes vaporizers, airway gas module, patient monitor.



Ventilator operating specifications

Modes of ventilation – included

VCV (Volume Control) Mode with tidal volume compensation

PCV (Pressure Control Ventilation)

Cardiac Bypass

Modes of ventilation – optional

PCV-VG (Pressure Controlled Ventilation-Volume Guarantee)

SIMV (Synchronized Intermittent Mandatory Ventilation)

(volume and pressure)

PSVPro™ Mode (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

Recruitment maneuvers

VCV Cardiac Bypass

End Tidal Control

Ventilator parameter ranges

Tidal volume range:	PCV, PCV-VG, SIMV PCV, SIMV PCV-VG 5 to 1500 mL VCV, SIMV VCV 10 to 1500 mL
Incremental settings:	5 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 85 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 mode and SIMV PCV-VG; 4 to 60 bpm for CPAP+PSV (increments of 1 breath per minute)
Inspiratory/expiratory ratio:	6:1 to 1:8 (increments of 0.1) (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:	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 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:	No breath detected in up to the Apnea delay time
Apnea delay time:	10 to 30 seconds
Breath detection:	≥5 mL (≥3 mL is set tidal volume < 10 mL)
Low airway pressure:	4 cmH_2O above PEEP
High pressure:	12 to 85 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 Pmax
	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 Pmax
	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:	22" (actual size 55 cm / 21.52 in)
Pixel format:	1920 x 1080

Battery backup

Backup power:	Battery time is 90 minutes when fully charged, which supports full system functionality and ventilation.
Battery type:	Internal LiFePO4

Communication ports

3x RJ45 ports (network connection)

3x RJ45 ports (serial connection)

1x USB port

1x USB 3.0 port (reserved)

Ventilator components

Delivery

Vaporizers:	Serenity™ model T digital vaporizer
Number of positions:	2
Mounting:	Slide-in, with quick release button

Airway modules

General

Supported modules:	E-sCAiO, E-sCAiOV, E-sCAiOVx, E-sCAiOE, E-sCAiOVE
Size (HxWxD), excluding water trap:	112 x 37 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™ Water Trap check and D-fend replacement.

Non-disturbing gases:

Ethanol, acetone, isopropanol, methane, nitrogen, nitric oxide, carbon monoxide, 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_2O)

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

Anaesthetic agent (AA)

Isoflurane

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™ Flow Sensor 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_2O	
Accuracy**:	±1 cmH_2O	
Display units:	cmH_2O, 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_2O	1 to 100 mL/cmH_2O
Airway resistance		
Measurement range:	0 to 200 cmH_2O/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:**	**at 30 L/min:**
	0.5 cmH_2O	1.0 cmH_2O

**Typical value

Electrical specifications

Current leakage

Normal condition:	< 100 µA
Single fault condition:	< 500 µA

Power

Power input:	100-120 Vac, 50/60 Hz 220-240 Vac, 50/60 Hz

Power cord:

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

Inlet modules

100/120 V

With outlets:	12A

220/240 V

With outlets:	8A

Outlet modules (optional)

100/120 V

4 outlets from top to bottom: 3A, 2A, 2A, 2A,
individual breakers, isolation transformer (optional)

220/240 V

4 outlets from top to bottom: 2A, 1A, 1A, 1A, individual breakers, isolation transformer (optional)

Japan

3 outlets from top to bottom: 3A, 2A, 2A, individual breakers, isolation transformer (optional)

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 150 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, AS4059, S90-116, or NIST All fittings available for O_2, N_2O, 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_2O (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_2O 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:	0 and 150 mL/min to 15 L/min Minimum total flow O_2 and balance gas is 150 mL/min

Measurement accuracy

for O_2, Air and N_2O:	±5% of setting value, or ±20 mL/min (larger of)
O_2 concentration range:	21% to 100% when Air is available
O_2 Cell accuracy:	± 2.5% full scale plus 2.5% of reading
Compensation:	Temperature and atmospheric pressure compensated to standard conditions of 20°C and 101.3 kPa
Hypoxic guard:	Electronic Mixer: Provides a nominal minimum 25% concentration of oxygen in O_2/N_2O mixture. ALT O_2, 0 to 8-15 L/min

Materials

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

Environmental specifications

System operation

Temperature:	10° to 35°C (50° to 95°F)
Humidity:	15 to 90% relative humidity (non-condensing)
Altitude:	-440 to 3200 m (520 to 800 mmHg)

System storage

Temperature:	-20° to 60°C (-4° to 140°F)
Humidity:	15 to 90% 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
Standard compliance:	AAMI ES60601-1, CSA C22.2 #601.1, EN/IEC 60601-1, ISO 80601-2-13
European Notified Body	
CE Mark:	CE0197

Breathing circuit specifications

Carbon dioxide absorbent canister

Absorbent capacity:	Reusable canister 1370 mL Disposable canister 1400 mL

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 ID, socket ISO 80601-2-13:2022 compliant

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 gases 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 1000 mL Reusable canister 1000 mL Disposable canister

Expiratory breathing resistance

l/min	kPa	cmH_2O
2.5	<0.089	<0.90
15	<0.32	<3.20
30	<0.43	<4.35

All the tests are done under a fresh gas flow rate of 10 l/min oxygen. Values include breathing tubes, water traps, D-lite/Pedi-lite, heat and moisture exchanger with integrated bacterial/viral filter (HMEF), Elbow and Y-piece. Patient circuit accessory and breathing system configurations affect resistance.

Anaesthetic gas scavenging

AGSS Type	Hospital extract system required	Machine connection
High vacuum, low flow:	High vacuum 36 +/- 3 L/min @ 12 inHg (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 50 to 80 L/min ISO 1H	BSI 30 mm threaded
Low vacuum, low flow:	Low vacuum 25 to 50 L/min ISO 1L	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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This document applies to Carestation 850.

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