

# CARESCAPE™ Respiratory Modules E-sCO(V), E-sCAiO(V), E-sCAiO(V)E, E-sCOVX, E-sCAiOVX

Monitoring respiratory and ventilatory parameters for adult, pediatric and neonatal patients in anesthesia and critical care applications



This family of compact respiratory modules is designed to support respiratory monitoring in anesthesia and critical care areas. Depending on the module type, host device software version and the clinical application, they provide measurements of airway gases, anesthetic agents with agent identification, Patient Spirometry and Gas Exchange. The modules are compliant with IEC 60601-1 3rd edition.

## Features

- Airway gases measured by the sidestream method
- Eight module versions available to meet the needs of various care areas
- All parameter values sampled proximal at the patient's airway with a single gas sampling line, D-lite(+)(++) or Pedi-lite(+) flow sensor, along with an additional Spirometry tube
- Et and Fi values updated breath by breath
- Fast oxygen measurement for accurate EtO<sub>2</sub> and FiO<sub>2</sub> values
- Automatic identification of anesthetic agents
- Detects end inspiratory and end expiratory occlusions automatically and displays values for Statis Plat, Static PEEPi+e and Static Compliance
- Calculated balance gas value for estimating the N<sub>2</sub>-concentration
- Very compact size, low weight and low power consumption

## Clinical measurements

- CO<sub>2</sub> and N<sub>2</sub>O – GE infrared technology: Inspired and end-tidal values, CO<sub>2</sub> waveform and respiration rate

- Respiration rate – calculated from the CO<sub>2</sub> waveform
- Anesthetic agents – GE infrared technology
  - Measures and identifies all five agents and two agent mixtures: halothane, enflurane, isoflurane, sevoflurane and desflurane
  - MAC (Minimum Alveolar Concentration)
  - MACage with age, temperature and ambient pressure compensation
- Patient oxygen – GE paramagnetic oxygen (O<sub>2</sub>) technology: Inspired, end-tidal and Fi-Et difference, waveform
- Patient Spirometry – Designed to measure true patient values independent of the ventilator with GE-patented D-lite(+)(++) and Pedi-lite(+) flow sensors and gas samplers at the patient airway
  - Numerical values for airway pressure, minute and tidal volumes, compliance, airway resistance and I:E ratio values, and flow and airway pressure waveforms
  - Continuous measurement of intrinsic, extrinsic and total PEEP
  - Pressure-volume and flow-volume loops
  - Ability to store and print up to six loops
  - Recall saved loops to compare to current loop
  - Module keys to save or change loop view
- Gas exchange - Non-invasive and continuous measurement
  - Oxygen consumption ( $\dot{V}O_2$ ) and carbon dioxide production ( $\dot{V}CO_2$ )
  - Values for energy expenditure (EE) and respiratory quotient (RQ)

## Technical specifications

### General

When monitoring neonatal or other patients that have high respiration rate or low tidal volume these modules shall be used within the limits of respiration rates and tidal volumes to ensure specified measurement accuracy.

Sampling flow 120 ±20 ml/min

Size and fit of gas sampling accessories may impact measured gas concentration values at low tidal volumes. Always ensure use of appropriate accessories according to patient and application.

Automatic compensation for atmospheric pressure variation (660-1060 mbar), temperature and CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>O, agent cross effect compensation. Parameter display update interval typically breath-by-breath.

Functional alarms for

- Disconnected water trap
- Partially blocked sample line or water trap
- Low gas sampling flow
- Blocked sample line or water trap
- Blocked sample gas outflow

### Letters in the module name stand for

s = Single-width module

C = CO<sub>2</sub> and N<sub>2</sub>O

Ai = Anesthetic agents and agent identification

O = Patient O<sub>2</sub>

V = Patient Spirometry

E = End-tidal control support with Aisys™ CS<sup>2</sup>

X = Gas Exchange metabolics  $\dot{V}O_2$ ,  $\dot{V}CO_2$ , RQ and EE

### Non-disturbing gases

- Ethanol, acetone, isopropanol, methane, nitrogen, nitric oxide, carbon monoxide, water vapor and freon R134A.
- Maximum effect of non-disturbing gases on readings: O<sub>2</sub> & N<sub>2</sub>O <2vol%, CO<sub>2</sub> < 0.2 vol%, AA < 0.15 vol%.

### Carbon dioxide (CO<sub>2</sub>)

GE infrared absorption sensor technology

CO<sub>2</sub> waveform

EtCO<sub>2</sub> End-tidal CO<sub>2</sub> concentration

FiCO<sub>2</sub> Inspired CO<sub>2</sub> concentration

Measurement range 0 to 15 vol%  
(0 to 15 kPa, 0 to 113 mmHg)

Accuracy ±(0.2 vol% + 2% of reading)  
Rise time < 260 ms with 2 and 3 m sampling line  
< 310 ms with 6 m sampling line

Adjustable low and high alarm limits for EtCO<sub>2</sub> or FiCO<sub>2</sub>

### Respiration rate (RR)

Measurement range 4 to 100 breaths/min

Detection criteria 1 vol% change in CO<sub>2</sub> level

Accuracy ±1/min in the range  
4 to 20 breaths/min  
±5% in the range  
20 to 100 breaths/min

Alarm note sent to host device if no breath detected in 20 seconds

### Patient oxygen (O<sub>2</sub>)

GE differential paramagnetic sensor

O<sub>2</sub> waveform

FiO<sub>2</sub> Inspired O<sub>2</sub> concentration

EtO<sub>2</sub> End-tidal O<sub>2</sub> concentration

FiO<sub>2</sub>-EtO<sub>2</sub> Inspired-expired difference

Measurement range 0 to 100 vol%

Accuracy ±(1 vol% + 2% of reading)

Rise time < 260 ms with 2 and 3 m sampling line  
< 310 ms with 6 m sampling line

### Nitrous oxide (N<sub>2</sub>O)

GE infrared absorption sensor

FiN<sub>2</sub>O Inspired N<sub>2</sub>O concentration

EtN<sub>2</sub>O End-tidal N<sub>2</sub>O concentration

Measurement range 0 to 100 vol%

Accuracy ±(2 vol% + 2% of reading)  
N<sub>2</sub>O ≤ 85%

Note: N<sub>2</sub>O is only displayed with CARESCAPE ANE and PACU software

### Anesthetic agent (AA)

GE infrared absorption sensor

Anesthetic agent waveform

FiAA Inspired anesthetic agent concentration

EtAA End-tidal anesthetic agent concentration

MAC or MACage value options for hosts

Agent mixture detection

Measurement range

Sevoflurane 0 to 8 vol%

Desflurane 0 to 20 vol%

Isoflurane, enflurane,  
halothane 0 to 6 vol%

Accuracy  $\pm(0.15 \text{ vol}\% + 5\% \text{ of reading})$

### Agent identification

Identification threshold 0.15 vol%

Detection time <20 sec

### Patient Spirometry

Pressure-volume loop, flow-volume loop, airway pressure and flow waveforms updated breath by breath

Adjustable low and high alarm limits for Ppeak, PEEPtot and MVexp

Messages for MVexp << MVinsp and for low volumes

Through selection of D-lite or Pedi-lite gas sampling and flow sensor from menu, the following specifications apply:

	<b>D-lite(+)(++)</b>	<b>Pedi-lite(+)</b>
<i>Respiration rate</i>	4 to 35 breaths/min	4 to 70 breaths/min
<i>Tidal volume</i>		
Measurement range	150 to 2000 ml	5 to 300 ml
Accuracy	$\pm 6\%$ or 30 ml	$\pm 6\%$ or 4 ml
<i>Minute volume</i>		
Measurement range	2 to 20 l/min	0.2 to 5 l/min
<i>Airway pressure</i>		
Measurement range	-20 to +100 cmH <sub>2</sub> O	-20 to +100 cmH <sub>2</sub> O
Accuracy	$\pm 1 \text{ cmH}_2\text{O}$	$\pm 1 \text{ cmH}_2\text{O}$
Display units	cmH <sub>2</sub> O, mmHg, kPa, mbar, hPa	
<i>Flow</i>		
Measurement range	-100 to +100 l/min	-25 to +25 l/min
<i>I:E</i>		
Measurement range	1:4.5 to 2:1	1:4.5 to 2:1
<i>Compliance</i>		
Measurement range	4 to 100 ml/cmH <sub>2</sub> O	1 to 100 ml/cmH <sub>2</sub> O

### Airway resistance

Measurement range	0 to 200 cmH <sub>2</sub> O/l/s	0 to 200 cmH <sub>2</sub> O/l/s
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The presence of xenon or helium in the breathing circuit causes incorrect measurement values.

### Sensor specifications

	<b>D-lite(+)(++)</b>	<b>Pedi-lite(+)</b>
Dead space	9.5 ml	2.5 ml

### Gas Exchange and metabolics<sup>†</sup>

$\dot{V}O_2$  Oxygen consumption

$\dot{V}CO_2$  Carbon dioxide production

Measurement range 20 to 999 ml/min

Respiration Rate range Adult 4 to 35 breaths/min

Pediatric 8 to 35 breaths/min

$\dot{V}CO_2$  and  $\dot{V}O_2$  Accuracy FiO<sub>2</sub> <65 vol% (and RR  $\leq$  30 breaths/min for D-lite++):  $\pm 10\%$  or 10 ml, whichever is greater

FiO<sub>2</sub> 65...85 vol% (or RR > 30 breaths/min for D-lite++):  $\pm 15\%$  or 15 ml, whichever is greater

CARESCAPE monitors B850 and B650 calculate and display Energy expenditure (EE) and Respiratory Quotient (RQ).

EE<sup>‡</sup> Energy expenditure

Display range 0 to 6000 kcal/d or 0 to 25120 kJ/d

RQ<sup>‡</sup> Respiratory Quotient ( $\dot{V}CO_2/\dot{V}O_2$ )

Display range 0.6 to 1.3

RQ resolution 0.01

The presence of xenon, N<sub>2</sub>O or helium in the breathing circuit causes incorrect measurement values.

<sup>†</sup> Measurement not applicable for neonatal patients

<sup>‡</sup> Calculated by host device. For more information on other host devices, refer to their user documentation.

### System compatibility

- CARESCAPE Monitor B850
- CARESCAPE Monitor B650
- CARESCAPE Monitor B450
- B40(i) Patient Monitor
- Aisys CS<sup>2</sup>
- Avance™ CS<sup>2</sup>
- Carestation 620/650/650c

Displayed data (including but not limited to TV, MV, RR, Raw and N<sub>2</sub>O) trends and alarms may vary depending on the host device. Specifications listed represent the capabilities of the modules. All module measurement options (Ai, V, X) may not be available in all host devices. Always check the host device's User Manual for additional information.



## Environmental specifications

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### Operating conditions

Temperature	10 to 40°C (50 to 104°F)
Relative humidity	10 to 98% RH, non-condensing
Ambient pressure	660 to 1060 mbar

### Storage conditions

Temperature	-25 to 60°C (-13 to 140°F)
Relative humidity	10 to 90% RH, non-condensing
Ambient pressure	500 to 1060 mbar

## Physical specifications

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Dimensions (H x W x D), 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)

## Imagination at work

Product may not be available in all countries and regions. Full product technical specification is available upon request. Contact a GE Healthcare Representative for more information. Please visit [www.gehealthcare.com/promotional-locations](http://www.gehealthcare.com/promotional-locations).

Data subject to change.

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DOC2025772 Rev 2 6/18



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# Single-width airway module, E-miniC

For compact CO<sub>2</sub> sidestream respiratory monitoring in Anesthesia and Critical Care Monitors



## Features

- CO<sub>2</sub> side stream measurement done at the patient's airway
- A new generation of the infrared technology used in Airway Gas Modules
- Very small and reliable measurement technology
- Inspired and end-tidal CO<sub>2</sub> values displayed on the screen as waveforms and in numerical format
- Full numerical and graphical trends of all measured data
- Measurement of respiration rate up to 80 breaths per minute
- Fast response time
- Wide measurement range for CO<sub>2</sub>
- Adjustable high and low limits for EtCO<sub>2</sub> and FiCO<sub>2</sub>
- CO<sub>2</sub> readings are not disturbed by ethanol, methane or nitrogen.
- Manual adjustment for N<sub>2</sub>O allowed for higher CO<sub>2</sub> measurement accuracy
- E-miniC accommodates Mini D-fend™ water separation system which is lightweight, ergonomically designed and has good tolerance for tilting



## Technical Data

### General

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Module size (WxDxH)	37 x 209 x 112 mm/1.5 x 8.2 x 4.4 in
Module weight	0.4 kg/0.9 lb
Sampling rate	150 ±25 mL/min

Displayed values updated breath by breath.

Functional alarms for

- Blocked sample line
- D-fend replacement
- D-fend check

Automatic compensation for atmospheric pressure variation (500 to 800 mmHg)

Manual N<sub>2</sub>O compensation allowed to improve CO<sub>2</sub> measurement accuracy

- When manual N<sub>2</sub>O compensation is not activated (N<sub>2</sub>O concentration 40 to 80%), CO<sub>2</sub> reading increases < 0.8 vol%
- When the manual compensation for N<sub>2</sub>O is activated (N<sub>2</sub>O concentration 40 to 80%), the error in the CO<sub>2</sub> reading is < 0.3 vol%

### Non-disturbing gases

Ethanol, Acetone, Methane, Nitrogen, water vapor

For nondisturbing gases the maximum effect on readings at 5.0 vol%: < 0.2 vol%



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### Carbon dioxide (CO<sub>2</sub>)

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EtCO <sub>2</sub>	End-tidal CO <sub>2</sub> concentration
FiCO <sub>2</sub>	Inspired CO <sub>2</sub> concentration
Measurement range	0 to 20 vol% (0 to 20 kPa, 0 to 150 mmHg)
Accuracy	CO <sub>2</sub> concentration 0 to 15 vol% ±0.2 vol% + 2% of reading CO <sub>2</sub> concentration 15 to 20 vol% ±0.7 vol% + 2% of reading
Rise time	< 300 ms with nominal flow
Adjustable low and high limits for EtCO <sub>2</sub> and FiCO <sub>2</sub>	

### Respiration Rate (RR)

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Measurement range	4 to 80 breaths/min
Breath detection	1% variation in CO <sub>2</sub> level
Accuracy	±1/min in the range 4 to 20 breaths/min ±5% in the range 20 to 80 breaths/min
Resolution	1/min
Adjustable low and high limits for respiration rate; alarm for apnea.	

### Ordering information

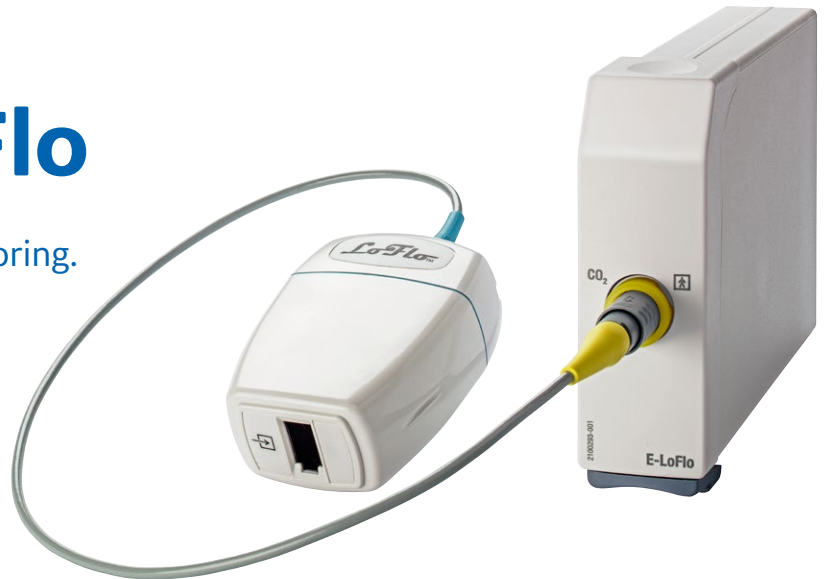
Description	Order code
Single-width airway module	E-miniC

For more information on the Mini D-fend, please refer to Accessories and Supplies catalog.

Note: E-miniC is intended for use for patients weighing over 5 kg/11 lb only.

# Low Flow CO<sub>2</sub> Module, E-LoFlo

For sidestream CO<sub>2</sub> respiratory monitoring.



The E-LoFlo Module is a single-width, plug-in module intended for CO<sub>2</sub> and respiration rate monitoring from adults to neonates. In addition, the measurement requires the use of Respirationics™ LoFlo™ Sidestream CO<sub>2</sub> Module. E-LoFlo module complies with IEC 60601-1 3rd edition.

## Features

- CO<sub>2</sub> sidestream measurement done at the patient's airway.
- Ideal for non-intubated patients.
- 50 ml/min airway gas sampling rate.
- Robust and long life pump reduces periodic maintenance.
- As a sidestream technology, no sensor required at airway.

## General

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Sampling rate 50 ±10 ml/min

Displayed values updated breath by breath

Manual O<sub>2</sub> and N<sub>2</sub>O compensation needed to improve CO<sub>2</sub> measurement accuracy

- When manual O<sub>2</sub> compensation is not activated (O<sub>2</sub> concentration 40 to 100%) CO<sub>2</sub> reading decreases < 0.4 vol%
- When the manual compensation for O<sub>2</sub> is activated (O<sub>2</sub> concentration 40 to 100%), the error in the CO<sub>2</sub> reading is < 0.15 vol%
- When manual N<sub>2</sub>O compensation is not activated (N<sub>2</sub>O concentration 30 to 80%), CO<sub>2</sub> reading increases < 0.8 vol%
- When the manual compensation for N<sub>2</sub>O is activated (N<sub>2</sub>O concentration 30 to 80%), the error in the CO<sub>2</sub> reading is < 0.3 vol%
- Effects of non-interfering gases and vapors:  
0 to 40 mmHg: ±1 mmHg additional error  
41 to 70 mmHg: ±2.5% additional error  
71 to 100 mmHg: ± 4% additional error  
101 to 150 mmHg: ±5% additional error

## Carbon dioxide (CO<sub>2</sub>)

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EtCO<sub>2</sub> End-tidal CO<sub>2</sub> concentration

FiCO<sub>2</sub> Inspired CO<sub>2</sub> concentration

Measurement range 0 to 19.7%  
(0 to 150 mmHg, 0 to 20 kPa)

Accuracy CO<sub>2</sub> concentration  
0 to 40 mmHg: ±2 mmHg  
41 to 70 mmHg: ±5% of reading  
71 to 100 mmHg: ±8% of reading  
101 to 150 mmHg: ±10% of reading

Above 80 breaths per minute: ±12% of reading

CO<sub>2</sub> Rise time: 200 to 310 msec depending on the sampling line

Adjustable low and high limits for EtCO<sub>2</sub> or FiCO<sub>2</sub>

## Respiration rate (RR)

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Measurement range 0 or 2 to 150 breaths per minute (BPM)

Breath detection 1% variation in CO<sub>2</sub> level

Accuracy ±1/min in the range

Resolution 1/min

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

## Monitor compatibility

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CARESCAPE™ B850, B650, B450 monitors with ESP V2.4 sw.

Displayed data trends may vary depending on the host device. Specifications listed represent the capability of the module.

## Performance specifications

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Functional alarms for

- Occlusion in sample line
- Sample line disconnected
- Pump Off

## Environmental specifications

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### Operating conditions

Temperature 10 to 40°C (50 to 104°F)

Relative humidity 10 to 90% RH non-condensing

Ambient pressure 700 to 1060 mbar

### Storage conditions

Temperature -20 to 60°C (-4 to 140°F)

Relative humidity 10 to 90% RH non-condensing

Ambient pressure 500 to 1060 mbar

## Physical specifications

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Dimensions (H x W x D) 112.5 mm x 37.5 mm x 192 mm  
(4.3 x 1.48 x 7.56 in)

Weight <0.5 kg (1.1 lb)



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